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VOLUME 48 NOVEMBER 1948 NUMBER 5

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TREATMENT OF CHRONIC SINUSITIS WITH PENICILLIN

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THIS REPORT is a record of the results obtained in 11 patients with chronic sinusitis treated with penicillin administered locally and systemically, alone and in combination. A large number of patients with acute, subacute and chronic sinus infections were treated successfully by the usual procedures, but these few did not respond. Even in so small a group there has been considerable variation in treatment with penicillin. An unusual opportunity was presented to observe them over a comparatively long time, since treatment was continued until maximum benefit was obtained.

Several authors [1] have reported favorable results with locally administered penicillin in the treatment of acute, subacute and chronic sinusitis. Satisfactory results have been obtained with penicillin administered systemically or locally combined with surgical procedure.[2]

Presented as a candidate's thesis to the American Laryngological, Rhinological and Otological Society, Inc., 1947.

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2. (*a*) Cracovaner, A. H., and Daly, J. F.: Sinusitis, Arch. Otolaryng. **45**:283-287 (March) 1947. (*b*) Denny, E. R.; Shallenberger, P. L., and Pyle, H. D.: Clinical Observations in the Use of Penicillin, J. Oklahoma M. A. **37**: 193-205 (May) 1944. (*c*) Hauser, I. J., and Work, W. P.: Treatment of Sinusitis with Penicillin, Arch. Otolaryng. **41**:161-169 (March) 1945. (*d*) Herrell, W. E.: Penicillin and Other Antibiotic Agents, Philadelphia, W. B. Saunders Company, 1945. (*e*) Hunnicutt, L. G.: Modern Treatment of Chronic

(Footnote continued on next page)

Hauser and Work [2c] reported cures of chronic suppurative sinusitis of relatively short duration by intramuscular injection of penicillin alone; however, in long-standing sinus disease penicillin alone appeared to have little, if any, value, but when used in conjunction with adequate surgical treatment of the sinuses rapid and complete cures were accomplished.

There have appeared many reports [3] of recovery of patients with osteomyelitis of the maxillary and frontal bones treated with penicillin combined with surgical eradication of the diseased bone. Johnson [1e] reported a case of pansinusitis with early osteomyelitis of the frontal bone and orbital cellulitis in which penicillin given locally through ureteral catheters in the frontal and maxillary sinuses and combined with systemic administration effected a cure.

Several unfavorable reports,[4] particularly regarding the treatment of chronic sinusitis, have been published. Burtoff [4a] reported no better results in cases of acute and subacute sinusitis with penicillin used locally than with isotonic saline solution.

Sinusitis, J. A. M. A. **133**:84-86 (Jan. 11) 1947. (*f*) Johnson, T. B., in Discussion on Penicillin in Rhinology, Proc. Roy. Soc. Med. **39**:279 (March) 1946. (*g*) Sale, G. G., and Diamond, E. H.: Chronic Suppurative Sinusitis Treated Locally with Penicillin by New Method, Arch. Otolaryng. **40**:406-408 (Nov.) 1944. (*h*) Schenck, H. P.: Antibiotics in the Treatment of Sinus Infections, Ann. Otol., Rhin. & Laryng. **56**:39-45 (March) 1947.

3. (*a*) Bloomfield, A. L.: Clinical Use of Penicillin, J. A. M. A. **124**:611-637 (March 4) 1944. (*b*) Harford, C. G.; Martin, S. P.; Hageman, P. O., and Wood, W. B., Jr.: Treatment of Staphylococcic, Pneumococcic, Gonococcic and Other Infections with Penicillin, ibid. **127**:253 (Feb. 3) 1945. (*c*) Hill, F. T.: Progress in Otolaryngology Since 1937: An Appraisal of the Present Status of Dr. Mosher's Unsolved Problems, Ann. Otol., Rhin. & Laryng. **55**:128-135 (March) 1946. (*d*) Kirby, W. M. M., and Hepp, V. E.: Treatment of Osteomyelitis of the Facial Bone with Penicillin, J. A. M. A. **125**:1019-1022 (Aug. 12) 1944. (*e*) Naffziger, H. C., and others: Penicillin in Infections Involving Central Nervous System and Skull, ibid. **131**:1183-1185 (Aug. 10) 1946. (*f*) Williams, H. L., and Nichols, D. R.: Spreading Osteomyelitis of the Frontal Bone Treated with Penicillin, Proc. Staff Meet., Mayo Clin. **18**: 467-469 (Dec. 1) 1943. (*g*) Footnote 1.g (*h*) Schenck.[2h]

4. (*a*) Burtoff, S.: Evaluation of Diagnostic Methods Used in Cases of Maxillary Sinusitis, with a Comparative Study of Recent Therapeutic Agents Employed Locally, Arch. Otolaryng. **45**:516-542 (May) 1947. (*b*) Priest, R. E.: Treatment of Suppurative Paranasal Sinusitis with Repeated Irrigations of Penicillin: A Negative Report, Ann. Otol., Rhin. & Laryng. **54**:786-796 (Dec.) 1945. (*c*) Williams, R. H. H., in Discussion on Penicillin in Rhinology, Proc. Roy. Soc. Med. **39**:279 (March) 1946. (*d*) Woodward, F. D., and Holt, T.: Local Use of Penicillin in Infections of the Ear, Nose and Throat: Results of Treatment, J. A. M. A. **129**:589-592 (Oct. 27) 1945. (*e*) Fowlkes.[1d]

A plea for conservatism in the treatment of chronic sinusitis has been made by Hunnicutt,[2e] Van Alyea [5] and Hill.[3c] Hunnicutt [2e] stated that in the examination of sinus linings removed in past years, rarely is chronically infected tissue found which would not have been capable of becoming a useful membrane if present knowledge of treatment had been applied. The majority of specimens show eosinophils, plasma cells and edema; they rarely show degenerative changes that have reached the point of being irreversible. "The recuperative powers of the mucous membrane of the sinuses are greater than was once supposed; hence its removal is less frequently done." Van Alyea,[5] discussing the management of chronic sinus disease, stated that most of the tissues removed at operation are not hopelessly diseased but will demonstrate marked healing tendencies under favorable conditions. Hill [3c] concluded: "In those cases when, after careful study, radical operation is deemed necessary, it should be understood that the result is apt to be a poor substitute for a normal nose, and the decision for operation made only when this possibly poor result will be better than what can be expected from more conservative measures."

The preferred method of parenteral administration of penicillin is intramuscular. For local administration of penicillin solution to the sinuses, the following methods are used: (1) single instillation following antral irrigation, (2) instillation through a retained sinus trocar,[2g] (3) instillation through an indwelling ureteral catheter,[1c, e] (4) administration by displacement irrigation (Proetz) and (5) inhalation of a penicillin aerosol.

To be effective locally, penicillin must be in contact with the infecting organisms for several hours before it exerts its maximal antibacterial action.[6] Williams [7] made the statement that in long-standing suppurative sinusitis penicillin must be given an opportunity to perform its antibiotic function on bacteria by removal of the protection given by pus and necrotic tissue.

Penicillin is bacteriostatic in the ordinary therapeutic concentrations and has some bactericidal properties in high concentrations, is nonhemolytic, is not affected by pus or by-products of the destruction of tissue, by large numbers of bacteria or by paraaminobenzoic acid.

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5. Van Alyea, O. E.: Management of Chronic Disease: Critical Analysis of Modern Therapeutic Measures, Ann. Otol., Rhin. & Laryng. **54**:443-457 (Sept.) 1945.

6. Anderson, D. G.: The Treatment of Infections with Penicillin, New England J. Med. **232**:400-429 (April 5) 1945. Crowe, Fisher, Ward and Foley,[1b] Herrell.[2d]

7. Williams, H. L., in discussion on Hauser, J., and Work, W. P.: Penicillin in Sinusitis, Tr. Am. Acad. Ophth. (1944) **49**:326 (July-Aug.) 1945.

The report of Crowe and co-workers [1b] in 1943 was very favorable toward the local use of penicillin. They felt that, in general, the following two requirements should be fulfilled in order to anticipate a favorable effect: The infection must be due to bacteria against which penicillin is effective, which are mainly staphylococci, hemolytic streptococci, pneumococci and anaerobic streptococci; and the penicillin solution must be brought into contact with the infected areas for a long enough period to permit a favorable action. In treatment of infections of mucous membrane or bone, much depends on the accessibility of the infecting organisms to the action of the drug. In acute spreading infections penicillin is usually most satisfactory because the organisms are near the surface; in chronic infections of mucous membranes organisms are deeply embedded.

TABLE 1.—*Cases with Treatment Primarily with Penicillin Administered Systemically*

Case No.	Diagnosis	Duration, Yr.	Organism	Penicillin Sensitivity	Dosage of Penicillin	Duration of Pus, Days	Duration of Observation, Mo.	Result
1	Chronic suppurative pansinusitis, right	4½	Nonhemolytic streptococci, diphtheroids	+	Local, 45,000 units; intramuscular, 1,440,000 units (12 days)	5	2	Cured
2	Chronic suppurative maxillary sinusitis, right	3	No record	No record	Local, 8,000 units; intramuscular, 1,545,000 units (13 days)	8	2	Cured
3	Chronic suppurative maxillary sinusitis, right and left	1	Hemolytic streptococci	+	Local, 33,000 units; intramuscular, 2,065,000 units (13 days)	8	1½	Cured

For maintaining penicillin contact locally for bacteriostatic and bactericidal activity, it appears that the method of choice is the instillation of the solution at definite intervals and of definite doses through an indwelling catheter. A retained ureteral catheter is more satisfactory than a trocar because it is more flexible and the danger of perforating the orbital plate by a sudden move or blow is obviated. There is no limit to activity, and it can be left in place for several days.

The procedure for instillation of penicillin into the antrum through a ureteral catheter is as follows: After puncture of the antrum through the inferior meatus with an antral needle of sufficient gage, such as a Dean needle, a no. 4 or 5 ureteral catheter is passed through the needle so that about 1 inch (2.5 cm.) protrudes from the distal end. The needle is then withdrawn, leaving the catheter in place. The extranasal portion of the catheter is cut off, just enough being left to tape to the face. Penicillin may then be injected through the catheter with

a 25 gage hypodermic needle and syringe, carried out with aseptic technic. The extranasal end of the catheter is plugged with a sterile steel victrola needle (fig. 8).

The cases reported in this paper are grouped according to the predominant mode of administration of penicillin. In the cases listed in tables 1, 2 and 4 treatment was under my personal supervision; in those in table 3 treatment was supervised by my predecessors in an Army general hospital, and the table contains only a record of the results of treatment.

Each of the first three patients (table 1), treated in the European theater of operations in 1944, was first treated with penicillin administered locally for a limited time, in single instillations following several

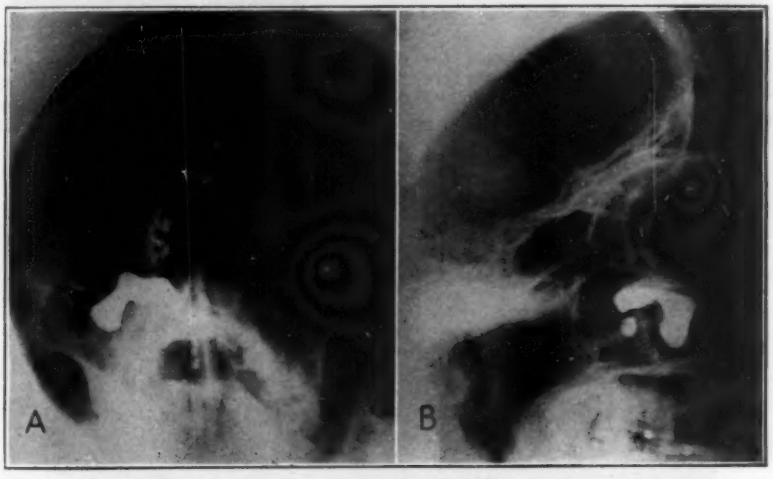

Fig. 1 (case 1).—Roentgenogram of the right maxillary sinus after instillation of iodized oil three days before the institution of intramuscular administration of penicillin. There is pronounced thickening of the lining membrane; only a small amount of the contrast medium is retained. There was foul pus in the antral washing. *A*, posteroanterior view; *B*, lateral view.

antral lavages or in repeated instillations every three hours for twenty-four hours through a retained antral needle.[2g] The results were unsatisfactory. However, after penicillin was administered intramuscularly for several days, the clinical response was excellent.

Case 1 (table 1).—P. D. S., aged 28 years, complained of a heavy nasal discharge from the right side of the nose for four and one-half years and intermittent right frontal headache for two years. On examination a profuse amount of mucopus appeared from the middle meatus, in which region there were polypoid changes. A roentgenogram showed clouding of the right maxillary, ethmoid and frontal sinuses. A total of 42 Gm. of sulfadiazine was administered for six days following admission (Dec. 29, 1944). There was considerable mucopus recovered in the first antral washing and less pus in the second washing; the third washing

Fig. 2 (case 2).—Roentgenograms showing the right maxillary sinus after instillation of iodized oil on the eighth day of intramuscular penicillin therapy. The sinus is almost completely filled with contrast medium. There is only slight thickening of the lining membrane. The antral washing was clear. *A*, postero-anterior view; *B*, lateral view.

Fig. 3 (case 3).—Roentgenogram showing the left maxillary sinus with iodized oil instilled six days before the start of penicillin therapy. There was moderate thickening of the lining membrane of this sinus, although the antral washing was clear.

was clear. After each irrigation, penicillin was instilled (5, 8 and 8 cc., respectively, of a solution containing 1,000 units per cubic centimeter). On Jan. 11, 1945, there was still considerable mucopus in the middle meatus. Five days later a large amount of foul-smelling pus was present in the antral washing. Postero-anterior and lateral roentgenograms (fig. 1) after instillation of iodized oil U. S. P. showed pronounced thickening of the antral lining. An antral needle was inserted, and 3 cc. of penicillin solution (1,000 units per cubic centimeter) was instilled every three hours for eight times, without improvement. Intramuscular injections of penicillin (15,000 units every three hours) was started on January 19. The nose was clean five days later, and remained so until the patient returned to duty. An antral washing on the eighth day of treatment was

Fig. 4 (case 3).—Roentgenogram showing the right maxillary sinus with iodized oil instilled one day before the start of penicillin therapy. There is moderate thickening of the lining membrane of this sinus. The oil which was instilled into the left antrum six days previously has emptied completely.

clear, and roentgenograms (fig. 2) showed almost complete filling. Penicillin was administered for twelve days.

CASE 2.—W. B. S., aged 32 years, complained of a thick yellow discharge from the right side of the nose for three years. On examination there was pus in the right middle meatus. Washings from the right antrum on Jan. 16, 1945, and again ten days later, contained considerable mucopus. After the second washing 5 cc. of penicillin solution (1,000 units per cubic centimeter) was instilled. Nine days later intramuscular administration of penicillin was started (15,000 units every three hours). Antral washings were clear four days and eight days after the start of systemic treatment, which was continued for thirteen days. Roentgenograms showed decrease in the thickening of the lining membrane.

CASE 3.—L. G., aged 31 years, complained of nasal discharge and intermittent throbbing pain on the left side of the face and head for a year, which had been worse during the month preceding admission. On examination there were mucopus and polypoid changes in both middle meatuses. A roentgenogram showed both antrums cloudy, and washings from both contained considerable foul pus. After two more irrigations, washings from the left antrum were clear, but a roentgenogram (fig. 3) after instillation of iodized oil showed considerable thickening of the lining membrane of the left antrum. Washings from the right antrum still contained foul pus, even after 3 cc. of penicillin solution (1,000 units per cubic centimeter) was instilled every three hours for eight instillations. On February 3 a roentgenogram (fig. 4) after instillation of iodized oil showed considerable

Fig. 5 (case 3).—Roentgenogram showing both maxillary sinuses with iodized oil instilled on the eighth day of intramuscular penicillin therapy. There is only slight thickening of the lining membrane of both sinuses. Washings from both antrums were clear.

thickening of the right antrum. Intramuscular administration of penicillin was started the next day. Washings from both antrums were clear eight days later. A roentgenogram (fig. 5) after instillation of iodized oil showed only slight thickening of the lining membrane of both antrums. Systemic administration of penicillin was continued for thirteen days, at the end of which time roentgenograms showed apparently normal conditions.

In the remaining cases (tables 2, 3, and 4) the patients were treated or observed in an Army general hospital in the United States from August 1945 to February 1946.

Table 2 includes a group of 4 cases in which treatment was supervised by my predecessors. I observed the results of the treatment, which consisted in instillation of penicillin solution locally every three hours through an indwelling ureteral catheter over a period of several days. Penicillin was not administered systemically. Two were cases of allergic rhinitis with superimposed infection in which there was only temporary improvement. In case 6 there was no improvement. In case 7 only was there improvement. One month after treatment the right antral washing was clear and a roentgenogram made after instillation of iodized oil showed very little thickening of the antral lining.

TABLE 2.—*Cases with Treatment with Penicillin Locally*

Diagnosis	Duration, Yr.	Organism	Penicillin Sensitivity	Operation	Interval Between Operation and Penicillin, Mo.	Dosage of Penicillin	Duration of Pus	Duration of Observation, Mo.	Result
Allergic rhinitis with superimposed infection	10	No record	No record	Nasal polypectomy before admission	1	Local, 300,000 units (10 days) through catheter, right and left	Slight amount	2	Temporary improvement
Allergic rhinitis, severe, with superimposed infection; nasal polypi, right	3	Right, no growth; Left, hemolytic Staph. aureus; diphtheroids	— +	Nasal polypectomy before admission	1	Local, 2 courses of penicillin through catheter, right and left; first, 150,000 units (5 days); second, 210,000 units (7 days) 1 mo. later	Nose clear for 3 wk. after second course	4	Temporary improvement
Chronic suppurative maxillary sinusitis, severe, right and left; nasal polypi	8	Staph. albus; Nonhemo. streptococci	+ +	Polypectomy and submucous resection before admission	18	Local, 210,000 units (7 days) through catheter	No change	1½	No improvement
Chronic suppurative maxillary sinusitis, severe, right	12	Nonhemolytic Strep.; B. influenzae	+ +	None	..	Local, 210,000 units (7 days) through catheter	Slight mucoid discharge right and left	4	Improvement

Table 3 includes 2 cases of severe bilateral chronic pansinusitis. In case 8 the patient had undergone several surgical procedures on the sinuses in the preceding years. Repeated antral washings contained foul creamy pus. After systemic administration of penicillin there was only a slight discharge noted in both sides of the nose. Roentgenograms still showed thickening of the lining of both the right and the left antrum. In case 9 the right ethmoid area was filled with a polypoid growth which bled easily. Tissue from the growth sectioned for microscopic study was reported as chronic inflammatory tissue. Roentgenograms and clinical observations suggested a slowly expanding lesion within the right frontal sinus. A right external frontoethmoid operation was done. Creamy pus under pressure presented when opening into the right frontal sinus. Moderately thickened mucous membrane was removed, and ethmoid cells were cleaned out. The

postoperative course was uneventful; the wound healed in three days, and the nose was free from pus in six days. Penicillin was administered for ten days starting twenty-four hours preoperatively.

The principles of surgical drainage remain unchanged with antibiotic therapy. Used preoperatively, the antibiotics limit the spread of infection and provide a period of safety; used postoperatively, they limit infection and shorten the healing period.

TABLE 3.—*Cases with Treatment with Penicillin and Operation (Combined)*

Case No.	Diagnosis	Duration, Yr.	Organism	Operation	Interval Between Operation and Penicillin	Dosage of Penicillin	Duration of Pus, Days	Duration of Observation, Mo.	Result
8	Chronic pansinusitis, severe, R. and L.	7	No record	Polypectomy and antromeatal window, left	Started 48 hours preoperatively	Intramuscular, 2,000,000 units (10 days)	Sl. discharge, R. & L.	3	Improvement
9	Chronic pansinusitis, severe, R. and L.	Many	Nonhemo. Staph. albus; nonhemo. streptococci	Right external frontoethmoid operation	Started 24 hours preoperatively	Intramuscular, 2,130,000 units (10 days)	6	3	Improvement

TABLE 4.—*Cases with Treatment with Penicillin Systemically and Locally (Combined)*

Case No.	Diagnosis	Duration, Mo.	Organism	Penicillin Sensitivity	Dosage of Penicillin	Duration of Pus, Days	Duration of Observation, Mo.	Result
10	Chronic pansinusitis, suppurative, left	22	Staph. aureus	—	Local, 120,000 units (5 days) through catheter; intramuscular, 2,920,000 units (14 days)	4	4	Cure
11	Chronic pansinusitis, suppurative, severe, right and left	48	Hemolytic streptococci, Hemolytic Staph. aureus	+ +	Local, 240,000 units right and left through catheter; intramuscular, 1,800,000 units (2 days)	R. 5 L. 10	3	Cure

In table 4 are included 2 cases in which a combined method of treatment was used; penicillin was administered intramuscularly and locally by instillations through an indwelling ureteral catheter in the maxillary sinus, as previously described. The treatment was supplemented before and after with displacement irrigations of penicillin solution. In case 10 the organsim, Staphylococcus aureus, was not sensitive to penicillin. Williams [7] explained the good result that occasionally follows in such cases with penicillin-insensitive organisms by the following possibilities: 1. In mixed infections, such as often

exist in chronic sinusitis, unimportant saprophytes may multiply so freely that they destroy the true inciting organism. 2. Anaerobic organisms may be the true pathogen present. Isolation of organisms cultivated with such difficulty was impracticable in the present cases.

CASE 10.—J. B., aged 20 years, complained of left frontal headache and frequent head colds for two years. On examination there were considerable mucopus in the left middle meatus and nasopharynx, and tenderness in the region of the left frontal sinus. A roentgenogram on admission showed definite clouding of the left maxillary sinus and moderate clouding of the frontal sinuses. A washing from the left antrum one month later contained considerable foul-smelling granular pus. A roentgenogram after instillation of iodized oil showed considerable

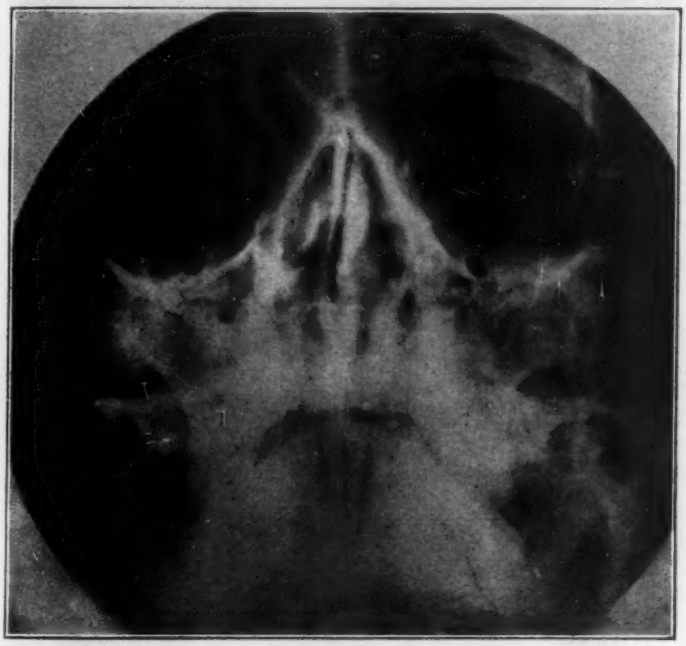

Fig. 6 (case 11).—Roentgenogram made on admission showing definite clouding of both right and left maxillary, ethmoid and frontal sinuses.

thickening of the lining membrane of the left maxillary sinus. On November 6, 1945 intramuscular administration of penicillin (25,000 units every three hours) was started. A washing from the left antrum three days later contained foul-smelling granular pus. A ureteral catheter was inserted, and 2 cc. of penicillin solution (2,000 units per cubic centimeter) was instilled every four hours day and night until the antral washing was clear. The catheter was removed on the fifth day. Systemic administration of penicillin was continued for a total of fourteen days, at which time the nasal fossae were clean. Eight days later a roentgenogram showed decrease in the thickening of the lining membrane. On return from furlough three weeks later, the patient had a mild acute nasopharyngitis but no recurrence of sinus suppuration.

CASE 11.—A. L., aged 30 years, complained of bilateral anterior nasal discharge and right frontal headache for four years, worse for four months before admission.

Fig. 7 (case 11).—Roentgenogram showing both maxillary sinuses with iodized oil instilled one month before the start of penicillin therapy. There is pronounced thickening of the lining of each antrum.

Fig. 8 (case 11).—Extranasal portions of the catheters.

During the previous few months he had several antral irrigations because of right maxillary pain. On examination there were polypoid changes in both ethmoid areas and mucopus in both middle meatuses and in the nasopharynx. A roentgenogram (fig. 6) taken on admission showed marked clouding of the maxillary, ethmoidal and frontal sinuses, right and left. The diagnosis was severe bilateral chronic suppurative pansinusitis. From Dec. 6, 1945 to Jan. 18, 1946 ten displacement irrigations were done, and a large amount of mucopus was recovered each time. During the same period six washings of both antrums contained foul-smelling granular pus. After the second antral irrigation (December 18), a roentgenogram (fig. 7) showed marked thickening of both antral linings. On Jan. 18, 1946, washings of the antrums contained foul granular pus. Local and

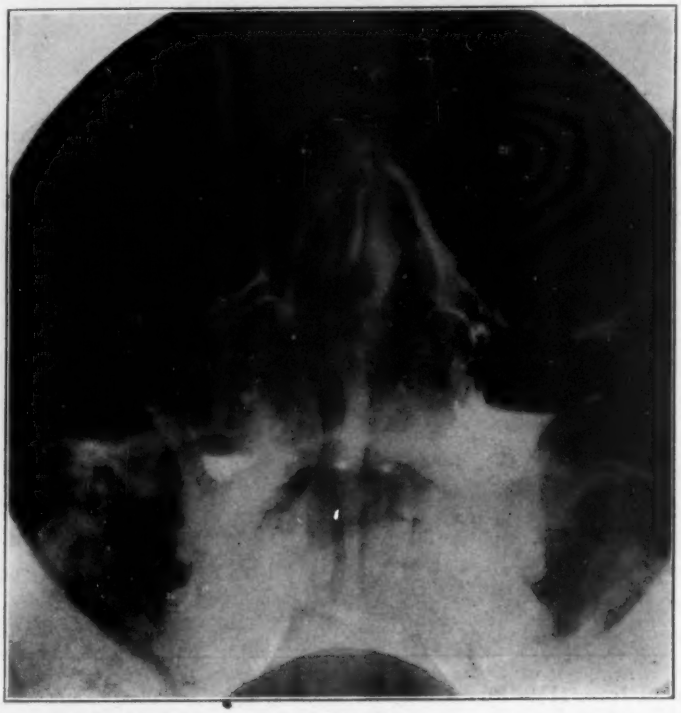

Fig. 9 (case 11).—Posteroanterior roentgenogram showing both maxillary sinuses with iodized oil instilled three days after the end of penicillin treatment. There is much less thickening of the antral linings than is shown in figure 7.

systemic administration of penicillin was started. A ureteral catheter (fig. 8) was inserted into each antrum. Two cubic centimeters of penicillin solution (2,000 units per cubic centimeter) was instilled into each antrum every four hours for ten days, and 25,000 units of penicillin was given intramuscularly every four hours for twelve days. On the fifth day a washing of the right antrum was clear; a washing of the left antrum contained a small amount of mucopus. On the twelfth day (January 30) both middle meatuses, the nose and the nasopharynx were clean. Washings of the antrums were clear. Diphtheroids were cultured from the right antrum, but there was no growths from the left. Roentgenograms made three days after the end of penicillin therapy (fig. 9) showed much less

thickening of the lining of both antrums than was noted on December 18. A roentgenogram taken five days later showed complete emptying of contrast medium from the right antrum and almost complete emptying from the left antrum. A few minutes later iodized oil was instilled into the right maxillary sinus and a final roentgenogram (fig. 10) was taken. It showed only slight thickening of the lining membrane of the right antrum. The washing from the right antrum was clear.

CONCLUSIONS

1. Penicillin is a definite adjunct to other methods of treatment of chronic sinusitis, with or without surgical procedures.

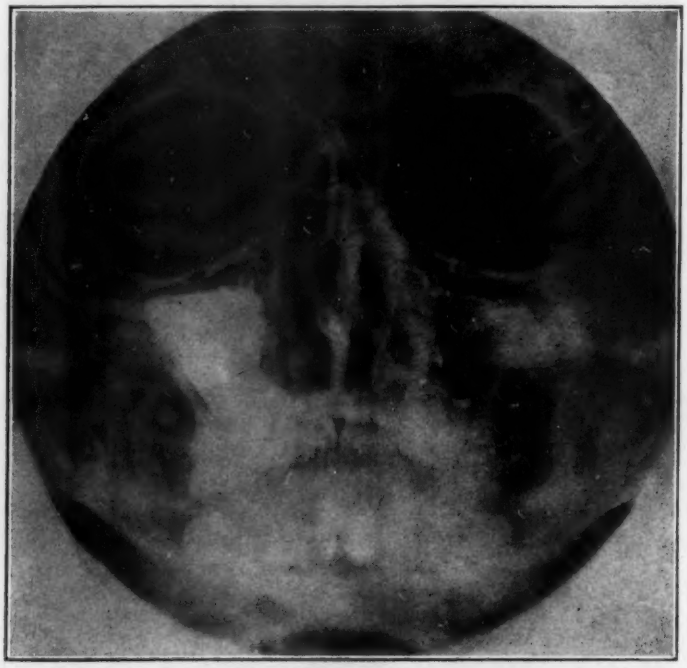

Fig. 10 (case 11).—Roentgenogram showing right maxillary sinus with iodized oil instilled five days after figure 9. Roentgenogram taken a few minutes after figure 9. There is only slight thickening of the lining membrane of the right maxillary sinus. (A roentgenogram [not shown] taken a few minutes before figure 10 was taken showed complete emptying of iodized oil from the right maxillary sinus and almost complete emptying from the left maxillary sinus).

2. In selected cases good therapeutic results from the use of locally or systemically administered penicillin alone may be anticipated when sensitive gram-positive cocci are predominant.

3. Penicillin administered locally through a ureteral catheter and systemically offers the best chance for cure without surgical intervention.

4. The principles of treatment of sinusitis should be reevaluated on the basis of present knowledge of chemotherapeutic agents.

VOICE REEDUCATION

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THAT the laryngologist would be better able to help those patients of his who are singers or speakers if he were acquainted with some of the basic facts of voice production will hardly be denied. A great deal of the trouble which brings both singers and speakers to the physician's office is of physiologic origin, and even when a pathologic condition is at the root of the trouble improper use of the vocal organ will retard recovery. In many cases a vicious circle is established into which it is extremely difficult to break. This is particularly true of those cases in which persistent abuse of the vocal mechanism induces pathologic conditions.

There appears to be little agreement as to what constitutes the basic facts of voice production. To understand fully the production of the voice requires a knowledge of anatomy, physiology, physics and some psychology. The voice is produced by the action of a psychophysical mechanism, and this must not be overlooked in any attempt to understand its operation.

There are a number of reasons for the confusion of ideas on this subject. People sang long before there was such a science as laryngology, and those who trained these early singers evolved all sorts of theories and practices which they believed were responsible for the success of their pupils. Many of these theories are still believed, and many of these practices are still in operation. It was assumed that the vocal organ was a musical instrument, an assumption which still persists in uninformed circles, and the obvious conclusion was that, this being the case, its training should be undertaken by one who was, first and foremost, a musician. The fact that the vocal organ is an integral part of the body and that in order to understand its construction and function one must have a knowledge of anatomy and physiology seems to have been overlooked. Furthermore, as though to add to the difficulties of one seeking to understand the facts of voice production, this system had worked in many cases sufficiently well to enable singers to achieve great fame, and even international recognition. Those on the outside might be easily forgiven if they were to say, "Well, what more do you want?" However, as is often true of seemingly simple solutions, this one does

by no means tell the whole story. Such a story would have to tell of the hundreds of potentially fine singers who are handicapped by incorrect use of their voices to such a degree that many of them never succeed even in getting far enough to make a professional appearance. It limits the vocal field to those possessing unusually rugged vocal equipment, which in many cases is the sole qualification some successful singers display, as is witnessed by the complaints of the agonized critics. Musical observers have always been at a loss to explain how it is possible for a singer to be the possessor of magnificent vocal equipment and yet actually be unmusical. But once it is realized that the vocal organ is not a musical instrument but a valve, the chief function of which is to keep food and liquid out of the lungs, this seeming paradox can readily be understood. Furthermore, the successful singer, despite the strength of his vocal organ, only too often experiences vocal trouble due to faulty habits of production. Even so great a singer as Caruso was forced to stop singing several times during his career, and did not sing at all during one season. Lucrezia Bori, one of the best known and best loved singers, had to retire from the musical world for a number of years, owing to the development of nodules on her vocal cords. These were surgically removed, and later Miss Bori was able to resume her career. However, since early diagnosis and proper treatment would have made surgical intervention unnecessary, her case is a glaring example of the evident lack of accurate knowledge with which the situation was handled.

A tremendous amount of research has been devoted to an understanding of the action of the larynx during phonation. Even if every detail of its functioning has not been completely understood, enough has been learned to enable the investigator to gain an accurate idea of what constitutes normal action. Despite the fact that laryngeal examinations are made with the patient's tongue drawn forward, a somewhat abnormal position from the standpoint of voice production, much can be learned as to the manner in which the singer is producing his tones. As an example, if the patient has difficulty in showing his larynx, it is an indication that his voice production is faulty. Forced voice production requires the tongue to be pulled down and back; laryngoscopy requires the tongue to be pulled forward, the epiglottis remaining in as upright a position as possible. The attempt to sing the familiar "E" raises the tongue still farther, and singers who have been misusing their voices find such a position almost impossible to achieve. Forced voice production is almost invariably accompanied with irritation of the posterior edges of the vocal cords, often extending to the arytenoid cartilages and even involving the epiglottis.

It is important to find a method which would make it possible to detect faulty voice production before its results become discernible by mirror laryngoscopy. Despite the excellent work which has been accomplished in the study of the larynx and its action, relatively little emphasis has been placed on the study of the entire throat and its function in the production of tone. The assumption seems to have been that the larynx works satisfactorily in most cases, and that when trouble develops it is due to what might be termed a self-destructive action on the part of the larynx. In other words, for some reason or reasons—physiologic, pathologic or psychologic—the larynx ceases to function normally. This view of the matter fails to take into consideration the fact that the action of the larynx is subconscious and that direct control of its action is impossible; so, in theory, the larynx will respond to any pitch within its normal range which the singer desires to produce.

But only too often there is a seemingly unbridgeable difference between theory and practice. The singer makes an attempt to sing, let us say, a tone high in the scale. When the voice does not respond, the singer increases the amount of energy used and succeeds in producing the tone. But since the action of the larynx is not subject to conscious control, the energy put forth must affect other muscles, and it goes to the extrinsic, or swallowing, muscles. These powerful muscles close the glottis in what might be called a partial swallowing act. At the same time, breath is driven against the cords with such power that they are literally blown apart, and the desired tone bursts forth. It is this type of voice production which can truly be called forced production, and which invariably brings about a decline in the vocal powers of the singer. The internal muscles of the larynx are incapable of closing the glottis in the manner described without the assistance of the external muscles. It is therefore of far greater importance to investigate the action of the external muscles than to concentrate on the larynx itself.

I shall now endeavor to answer a question which I am sure is in the mind of everyone who is interested in the improvement of a patient's voice production. Can the laryngologist step into the realm so carefully guarded by the so-called voice specialists and determine for himself whether his patient's larynx is being abused by a faulty method of voice production? This question can be answered with an unqualified "yes." All that is necessary is to place the finger above the patient's larynx, well up in the angle of the chin, and direct him to swallow. The strong muscular contraction which thereupon occurs should be carefully noted. Then, with the finger in a similar position, the patient is directed to sing or speak. If there takes place a muscular contraction similar to that observed during the act of swallowing, it is obvious that the

external, or swallowing, muscles are being used during phonation. Thus, the diagnosis is simple, even though the treatment takes time and patience.

In the following cases diagnosis was made by the combination of laryngoscopy and finger palpation, and treatment was carried out by the method of finger palpation.[1]

REPORT OF CASES

CASE 1.—A salesman in whom, in 1931, a contact ulcer developed, had for seven years been unable to continue his business, since any prolonged use of his voice rendered the condition of the ulcer acute. During these years he had consulted many physicians, undergone tests of various kinds and even worked with one or two voice specialists; but improvement was to be noted only after complete vocal rest. December 1939 was the date of the patient's last visit to me; he had at that time resumed his occupation and has not had any recurrence of his vocal disability.

In this case the chief problem was to stimulate the action of the internal vocal muscles without irritating the ulcer. It has been my experience that this can best be achieved by the use of singing exercises. These must be performed so lightly that approximation of the vocal cords is barely achieved; in the beginning only a limited range of pitch should be attempted. Great care must be taken to see that no help is being given by the external muscles; failure to eliminate this would defeat the purpose of the exercises. Only a small amount of work can be done at a time, and progress is necessarily slow, since long years of incorrect use of the voice weakens the internal muscles. The most careful cooperation on the part of the patient is necessary; without it satisfactory results cannot be achieved. An additional difficulty will be encountered if the patient is not sufficiently musical to be able to distinguish pitch, but even in such cases good results are possible, for it is indeed rare to find a person whose ear is totally defective.

CASE 2.—Despite the absence of any pathologic symptoms, the patient, a comptometer operator, found it impossible to speak. At the time I was consulted, this condition had existed for more than two years and had appeared after a severe attack of influenza. She had tried many and various remedies, to no avail, and it was decided finally that her problem was psychologic; for two years the attempt was made to remove the inhibitions believed to be responsible for her condition. When I first saw her, she was unable to tell me her name and had to write it down. Examination showed that this was a case of extreme weakness of the internal vocal muscles, which had been so weakened that approximation of the vocal cords was being brought about by the external muscles. The approximation was so violent that the vocal cords were prevented from

1. Zerffi, W. A. C.: Functional Vocal Disabilities, Laryngoscope **49**:1143 (Nov.) 1939.

vibrating. Until I had worked with this patient for some time, I was unable to learn just what had been responsible for the sudden failure of her voice. While she must always have been using an incorrect method of speech, it was not until she began to do an unusual amount of proofreading that the trouble became serious. Then, after she had influenza, the already greatly weakened vocal muscles simply refused to operate.

It is not generally realized that using the voice for reading places a far greater strain on it than does ordinary conversation. Reading is continuous, whereas in conversation there are always periods of rest, so that reading will cause vocal trouble to develop much more rapidly than will general conversation.

Treatment in this case was similar to that in case 1. However, since here no lesion was present, it was possible to attempt to produce tone without the extreme care which was mandatory when an ulcer existed. The early attempts at phonation were most discouraging to the patient; little by little, however, tone production became possible, and some of the tension of the external muscles was relieved. Slowly, singing tones were developed, and for a time these newer habits made singing easier for the patient than speech. At the time of writing, in spite of an occasional relapse, the patient's speaking voice had been restored, and, in addition, a singing voice had been developed.

Case 3.—A professional singer, the patient had been misusing his voice for many years. Despite his possession of an unusually rugged larynx, the forcing to which the voice had been subjected brought on a condition described by his laryngologist as inflammation of the vocal process, extending to the arytenoid cartilages and epiglottis, with the anterior commissure not visualizable. This man, by calling on all his resources and using every ounce of his vocal strength, had secured an important contract, but now was faced with the problem of either improving his voice production or being unable to fulfil his contract. In fact, his physician had repeatedly warned him that if he did not improve his method of singing it would be impossible for him to get through the season.

Since it was necessary for the singer to perform publicly while the strength of his internal muscles was being built up, and since any public singing could be accomplished only with the help of the external muscles, it became a matter of taking two steps forward and one step back. Every public appearance had to be followed by the most careful work, in order to recover the ground lost by the necessary forcing of the voice during the public performance. However, the first contract was successfully fulfilled, followed by a second and a third, so that there was justification in believing that this battle had been won.

A case such as this is complicated in many ways, for matters are to be taken into consideration which do not exist when the voice is used only for speech. Whereas the patient who desires to improve his speech is likely to accept advice without much question, every singer, no matter how ignorant he may be of the basic facts of voice production, feels it is his divine right to attempt to evaluate every suggestion offered. Since in most cases he is utterly incapable of doing so, much valuable time is often wasted in the attempt to overcome his many prejudices. In addition to this, the singer's confidence is usually badly shaken, so that psychologic problems ride alongside physiologic ones.

I present these cases of vocal disability in the hope that they may bring about a realization of the great need for cooperation between the laryngologist and the teacher of voice production.

To expect that the diagnosis of vocal disabilities and their subsequent treatment can be successfully conducted without more knowledge of voice production than is usually possessed by the laryngologist, and more knowledge of the physiology and pathology of the throat than is usually possessed by the voice teacher, is to expect the impossible. The human larynx is at once incredibly tough and extremely delicate. It is often able to withstand an incredible amount of abuse, but once it has succumbed to bad treatment it cannot be restored by rest or by the mumbo-jumbo of conventional voice teaching. To expect that those who have been trained solely in music or dramatics are able to diagnose and treat complicated mechanical defects in a highly complex human mechanism is manifestly absurd. On the other hand, voice is tone, and the attempt to diagnose and treat errors in the production of tone by mere observation of the action of the mechanism under the more or less abnormal conditions necessary to laryngoscopy is also doomed to failure. To be sure, a broken voice does not cause death, but it can cause untold misery and heartbreak, to say nothing of the patient's inability to make a living.

It is more than ninety years since Garcia invented the laryngoscope; and, while excellent use has been made of it, so far as pathology is concerned, the physiology of the larynx, and particularly the physiology of the entire throat, has been either neglected or misinterpreted. Sufficient knowledge is available if only it were applied. Those who must accept responsibility for the care and development of the voices of singers and speakers can certainly not afford to be satisfied with such a purblind attitude. Voice production has too long been used as a peg on which every Tom, Dick and Harry has hung his ideas. Facts are needed, and these facts are available to those who will devote the time and trouble necessary to understand them. Of what possible use is a diagnosis if it is not accompanied with suggestion for treatment? It is not rendering the singer a service to tell him he is misusing or overstraining his voice without being able to give him concrete help in overcoming his difficulties. With a concerted effort the whole subject of voice production can be raised to a level hitherto not even approached, and singers and speakers will be able to receive the help they so sorely need.

37 West Ninety-Fourth Street.

GAMMA GLOBULIN IN RELATION TO INFECTIONS OF THE RESPIRATORY TRACT

Experimental Study of the Local Use of Gamma Globulin in Treatment of the Common Cold

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THAT a virus or viruses are responsible for the initiation of the common cold appears probable from all available data, although little is known of the nature of the causative agent or agents. Owing to this lack of knowledge, little progress has been made toward specific therapy of the common cold. However, specific antibodies against many viruses pathogenic for man, whether or not such viruses produce only a temporary or a permanent immunity in man, have been found in fairly constant amounts in the gamma globulin from large pools of human plasma.[1] Thus, as in the case of epidemic influenza virus A or B,[1] it is entirely possible that specific antibodies against the virus. or virus agents initiating the common cold may also be present in such gamma globulin. Whether antibodies are present in such constant amounts and whether they are virus neutralizing in their effect are entirely conjectural. If one assumes that such specific antibodies are present in the gamma globulin, several possible approaches to the experimental study of their use in the common cold are apparent: (1) Use of gamma globulin by local application (*a*) in prevention and (*b*) in treatment; (2) use of gamma globulin by parenteral injection (*a*) in prevention and (*b*) in treatment.

The experimental use of gamma globulin by local instillation for the possible prevention of the common cold had been studied by Maris, Thacher and Stokes[2] in a series of children (from newborn infants to 4½ years of age) in a large orphanage. They were housed together continuously in large groups of 20 to 25 children to each

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1. Enders, J. F.: Chemical, Clinical, and Immunological Studies on the Products of Human Plasma Fractionation: X. The Concentrations of Certain Antibodies in Globulin Fractions Derived from Human Blood Plasma, J. Clin. Investigation **23**:510-530, 1944.

2. Maris, Thacher and Stokes: Unpublished data.

ward. Instillations of isotonic sodium chloride solution were used for the children serving as controls. The amount of gamma globulin (3 drops) and the number of intranasal instillations (one to two daily) were limited purposely in the interests of practicality so that if it proved efficacious the method could be applied on a wide scale. This study was conducted over a period of three months, from February to April inclusive, during the height of infections of the respiratory tract in this orphanage. The criteria used for the number and severity of colds were similar to those used in the present study. The number of days per common cold per child for the period studied was almost precisely the same for the children tested as for the children used as controls, except that those who had received instillations of isotonic sodium chloride solution had a higher incidence and apparently a somewhat greater severity of colds. Thus, if specific antibodies against the agent of the common cold were present in gamma globulin, they must have been readily dissipated or removed by the normal nasal secretion, or possibly diluted to a point at which they were no longer effective.

The second possible approach, i. e., treatment, was attempted as a result of a small number of inadequately controlled family experiments among members of the department of pediatrics, University of Pennsylvania School of Medicine, with the use of more frequent nasal instillations of gamma globulin in the treatment of the common cold. It is generally recognized that both local and general treatment of viral diseases with specific antibodies after the onset of symptoms is usually, although not always, ineffective. Nevertheless, the apparently successful results of these instillations in a few children who had been studied by a number of careful observers appeared to warrant a more extensive investigation.

METHOD OF STUDY

The work was conducted at the Pennsylvania School for the Deaf, among approximately 600 boys and girls, from 4 to 18 years, who were there in almost continuous residence. The numbers of boys and girls were approximately equal. The children lived at the school from October to June, except for occasional weekend visits or vacations at home. They lived in large open dormitories, ate together and attended daily classes together. Aside from their deafness, the children appeared to be normally healthy, except that there was a slightly higher incidence than usual of chronically running ears.[3]

A complete physical examination was made of each child, and each illness was recorded in detail on his chart. Thus, the past and present state of health of each child was well known.

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3. Hitschler, W. J., and Vastine, M. F.: A Study of Chronic Suppurative Otitis Media at the Pennsylvania School for the Deaf, Arch. Otolaryng. **43**:226-242 (March) 1946.

In this study, the presence or absence and the severity of a cold were determined objectively, not subjectively. The fact that these children talked but little, and then usually unintelligibly as far as the examiner was concerned, aided in preventing the examiner from knowing the subjective symptoms. The teachers and

SYMPTOMS OF COLD AS NOTICED BY TEACHER OR HOUSEMOTHER

Symptoms	Day of Observation						
	1	2	3	4	5	6	7
Crusting	.....	.....	.....	.....	.....	.....	.....
Sneezing	.....	.....	.....	.....	.....	.....	.....
Sore throat	.....	.....	.....	.....	.....	.....	.....
Coughing	.....	.....	.....	.....	.....	.....	.....
Malaise	.....	.....	.....	.....	.....	.....	.....
Stuffiness of nose	.....	.....	.....	.....	.....	.....	.....
Running nose	.....	.....	.....	.....	.....	.....	.....
Redness of nostrils	.....	.....	.....	.....	.....	.....	.....

housemothers were given small printed sheets (form) for recording the presence of crusting, sneezing, sore throat, coughing, malaise, stuffiness of the nose, running nose and redness of the nostrils. When any of these signs or symptoms was noted, the child was sent to the school infirmary, where a nurse, employed solely for this study, recorded her observations on a separate sheet for each child (table 1). An otolaryngologist then recorded his observations, which were checked by a second otolaryngologist. The conditions noted were listed as negative, or normal, and plus 1, plus 2 and plus 3, to indicate the degree of such symptoms as discharge, redness of nasal mucosa or crusting. The character of the nasal discharge was recorded as watery, mucoid, mucopurulent or purulent. The state of the patient was recorded as normal, questionable, acute (coryza), subacute (sinusitis) or chronic (sinusitis), depending on the objective findings, together with those already recorded by the housemothers, teachers and nurse.

Each child had his separate form. If the child was judged to have a cold, he was included in the group for study. Dr. George M. Coates was requested to examine one group for the purpose of checking the accuracy of the findings. His objective findings fully corroborated those recorded by us. All the children, whether treated or not, were examined daily until the signs and symptoms had disappeared. If they had not disappeared by the end of seven days, they were judged to be symptoms of a chronic condition.

All children having colds on examination were divided alternately into a treated and an untreated group. The average age of the treated group was 14.0 years and that of the untreated group 13.0 years. There were more children in the treated group than in the untreated group because for a period at the beginning of the experiment the nurse who selected the patients each day placed the first child with a cold in the treated group. The experiment was so arranged that the examiners were not permitted to know which child was treated or untreated. They were assisted in this by the fact that the children could not talk intelligibly. These records were kept separately by the nurse. The untreated children were brought to the infirmary with the treated ones in order to prevent the teachers and housemothers from knowing which were being treated. After the entire study was completed, each child's record was examined and con-

TABLE 1.—*Sample Chart*

Name: John Doe | Tonsils √ / No Tonsils | Diagnosis: Tentative: Acute cold / Final: "Acute cold"

Date and time of onset: 3/19/46 | Age 11

Colds per year—2
Past History: Negative
Miscellaneous Observations: None

No chronic infection of the upper respiratory tract

Date	Observer*	Cough	Temperature, F.	Sneezing	Stuffiness of Nose	Malaise	Ache	Sore Throat	Redness of Nostrils	Nasal Discharge: Watery	Mucoid	Mucopurulent	Purulent	Crusting	Nasal Membrane: Redness	Nasal Membrane: Swelling	Throat: Redness	Throat: Exudate	Eye, Conjunctivitis	Impression	Complications
3/19	N	—	98	+	++	—	—	—	+	..	..	..	..	..	..	..	..	..	..	.....	.....
3/19	O1	..	..	..	..	..	..	..	..	++	—	—	—	+	++	++	—	—	—	Acute cold	.....
3/19	O2	..	..	..	..	..	..	..	..	+	—	—	—	+	++	+	—	—	—	Acute cold	.....
3/20	T	+	..	—	+	—	—	—	—	..	..	..	..	..	..	..	..	..	..	.....	.....
3/20	O1	..	..	..	..	..	..	..	..	+	+	—	—	+	+	+	—	—	—	Acute cold	.....
3/20	O2	..	..	..	..	..	..	..	..	+	—	—	—	+	++	+	—	—	—	Acute cold	.....
3/21	T	—	..	—	+	—	—	—	—	..	..	..	..	..	..	..	..	..	..	.....	.....
3/21	O1	..	..	..	..	..	..	..	..	+	—	—	—	—	+	—	—	—	—	?	.....
3/21	O2	..	..	..	..	..	..	..	..	+	—	—	—	—	—	+	—	—	—	?	.....
3/22	T	—	..	—	—	—	—	—	—	..	..	..	.	..	..	..	..	..	..	.....	.....
3/22	O1	..	..	..	..	..	..	..	..	—	—	—	—	—	—	+	—	—	—	Normal	.....
3/22	O2	..	..	..	..	..	..	..	..	—	—	—	—	—	—	—	—	—	—	Normal	.....
Follow-up examination																					
4/ 7	O1	..	..	..	..	..	..	..	..	—	—	—	—	+	—	—	—	—	—	Normal	.....
4/ 7	O2	..	..	..	..	..	..	..	..	—	—	—	—	—	—	—	—	—	—	Normal	.....
4/16	O1	..	..	..	..	..	..	..	..	—	—	—	—	—	—	—	—	—	—	Normal	.....
4/16	O2	..	..	..	..	..	..	..	..	—	—	—	—	—	—	—	—	—	—	Normal	.....
....	...	..	..	..	..	..	..	..	..	—	—	—	—	—	—	+	—	—	—	Normal	.....

Summary

Duration: 3 days
Three day uncomplicated cold

Complications: None

Miscellaneous Observations: None

* N indicates nurse; O1, first otolaryngologist; O2, second otolaryngologist; T, teacher or housemother.

clusions were drawn therefrom, again without the knowledge of which child had been treated and which had not, except that a pediatrician assisted the nurse in reviewing the record during the period of study.

The treatment consisted of 3 to 4 drops of gamma globulin diluted with an equal part of isotonic sodium chloride solution U. S. P., dropped into each nostril every two hours from 8:00 a.m. until 6:00 p.m. daily. The child was placed on his back, with his head hanging over the edge of the bed; the drops were inserted, and the child was instructed to inhale. The nostrils were gently pressed together to facilitate the dissemination of the gamma globulin. No other treatment was used, nor did the untreated group receive any treatment whatever.

When the symptoms and signs had disappeared, all treatments and examinations were discontinued, until about a week later, when two examinations were made at different times to determine the condition of the child when he was presumably free from disease.

In order that the child should be discharged as cured, his condition had to be judged as either normal on one examination or questionable on three successive daily examinations. If, after the child had been in a group seven days neither of these conditions was met, the child was discharged as having a "chronic" infection. However, these children, as well as those who were free from signs and symptoms, were also examined subsequently on two occasions. If, during the time a child was in the group any complications (such as fever or symptoms of other disease) developed, the child was discharged from the group and treated in the conventional way. If a child was discharged after seven days as having "chronic" sinusitis and showed the same condition on the two subsequent examinations, his data were not included in the final conclusions. Such children were usually regarded as having chronic sinusitis or allergic rhinitis, depending on the findings. Not included in the group were children leaving for vacation and those failing to report for treatment or examination, or for other reasons. Also, a child was discharged from the group if at any time during the seven days his condition appeared to be chronic. For these reasons, the total number of completed cases was, unfortunately, reduced considerably. Accordingly, the conclusions were based only on the data for those children who first appeared to have acute coryza and who subsequently, either during the seven days or on the recheck examination, were found to be normal, who had no complications, whose condition did not become chronic and who did not leave the group.

A number of children whose condition appeared to be subacute at first examination were placed under the same regimen. The presence of a mucopurulent instead of a mucoid or watery nasal discharge was the determining factor in this classification. These children obviously did not have an uncomplicated cold but had, more likely, subacute sinusitis, and their results were not included with those of children who had uncomplicated colds. This group will be discussed later. The elimination of these cases was carried out by the examiners without knowledge as to which children were receiving the gamma globulin therapy.

To determine the presence and severity of a cold objectively is often surprisingly difficult. As an instance, at the time of examination the nose might contain much mucoid or watery discharge, and a few minutes later, after blowing, there might be none. On many occasions there was no pronounced redness of the mucosa. Errors made in diagnosis because of findings, however, would occur equally by chance in both the treated and the untreated group.

RESULTS

One hundred and sixty children comprised the groups with acute colds and with subacute sinusitis. Seventy-four children were subsequently dropped for reasons aforementioned, 70 being left in the group with acute colds and 16 in the group with subacute sinusitis. Of the 70 children who contracted common colds, 42 were treated and 28 were untreated (table 2).

The duration of the colds in the treated group was 2.74 days per person, and that of colds in the untreated group, 2.77 days per person. We noted that 59.6 per cent of the treated and 57.2 per cent of the untreated children fell into the category of colds of one and two days' duration. It is obvious that the results are entirely similar for the two groups.

TABLE 2.—*The Number and Duration of Common Colds in the Treated and the Untreated Group*

	Treated (42)		Untreated (28)	
Duration, Days	No. of Patients According to Length of Cold	Total Days of Cold *	No. of Patients According to Length of Cold	Total Days of Cold *
1	18	18	10	10
2	7	14	6	12
3	4	12	2	6
4	4	16	4	16
5	2	10	3	15
6	4	24	2	12
7	3	21	1	7
	42	115	28	78

* Value in column 1 times value in column 2 or column 4.

Of the group with subacute sinusitis, 9 patients who were treated and 7 who were untreated, showed no benefit from treatment, as was expected, although the numbers are too small for statistical comparison.

Complications.—Three children had "grip," 1 pharyngitis with fever and 1 measles; none was seriously ill. Four of these patients received the globulin treatment and 1 did not. In all probability, the treatment had no relation to these illnesses.

RELATION OF TONSILS AND ADENOIDS TO THE COMMON COLD

An analysis of the relation of the presence or absence of tonsils and adenoids to the duration of the colds might be of interest. Much has been written on this subject. Kaiser,[4] Fowler,[5] and others discussed

4. Kaiser, A. D.: Effects of Tonsillectomy on Respiratory Infections in Children, Bull. New York Acad. Med. **18**:338-346, 1942.

5. Fowler, R. H.: Tonsil Surgery Based on a Study of the Anatomy, Philadelphia, F. A. Davis Company, 1930.

the frequency of colds in children with or without tonsils and adenoids; little, however, has been said about the duration of colds. Townsend and Sydenstricker [6] stated that the "removal of large and diseased tonsils and adenoids may be beneficial . . . in preventing pharyngeal complications." Moore [7] listed "frequent and prolonged colds" under symptoms resulting from enlarged and diseased tonsils. Paton [8] studied a series of 909 school girls over a period of ten years and concluded that the group with tonsillectomy suffered much more from infections of the respiratory tract and lost more days from bronchitis alone than they gained in respect to tonsillitis. Selkirk and Mitchell [9] concluded that the duration and severity of colds in such groups is difficult to ascertain. Many of the mothers they interviewed thought that, as far as colds were concerned, the children were better

TABLE 3.—*Relation of Tonsils and Adenoids to the Common Cold*

	Tonsils and Adenoids Present (17)		Tonsils and Adenoids Absent (53)	
Days	No. of Patients According to Length of Cold	Total Days of Cold *	No. of Patients According to Length of Cold	Total Days of Cold *
1	3	3	24	24
2	4	8	8	16
3	1	3	4	12
4	1	4	6	24
5	0	0	4	20
6	2	12	3	18
7	6	42	4	28
	17	72	53	142

* Value in column 1 times value in column 2 or column 4.

after this operation, although the authors did not mention the specific relation of the common cold to the presence of tonsils and adenoids.

The Commission on Acute Respiratory Diseases [10] stated:

. . . the important relationship between the presence and absence of tonsils and streptoccocal parasitism was confirmed. Subjects with tonsils frequently

6. Townsend, J. G., and Sydenstricker, E., in Christian, H. A.: The Oxford Medicine, vol. 4, p. 954.

7. Moore, I.: The Tonsils and Adenoids and Their Diseases Including the Part They Play in Systemic Diseases, St. Louis, C. V. Mosby Company, 1928, p. 23.

8. Paton, J. H. P.: The Tonsil and Adenoid Operation in Relation to the Health of a Group of School Girls, Quart. J. Med. **12**:119-128, 1943.

9. Selkirk, T., and Mitchell, A. G.: Evaluation of the Result of Tonsillectomy and Adenoidectomy, Am. J. Dis. Child. **42**:9-41 (July) 1931.

10. A Study of Food-Borne Epidemic of Tonsillitis and Pharyngitis Due to β-Hemolytic Streptococcus, Type 5[1], Commission on Acute Respiratory Diseases, Bull. Johns Hopkins Hosp. **77**:143-210, 1945.

had confluent exudate, harbored the organisms in large numbers in early cultures and tended to remain chronic carriers. Subjects whose tonsils had been removed had less exudate, fewer streptococci, and rid themselves of the organisms sooner. Tonsillectomized patients tended to have lower initial levels of antistreptolysin and higher convalescent titers than patients with tonsils.

Of the 70 children who contracted common colds, 17 had tonsils and adenoids and 53 had had them removed. The average age of these children with tonsils and adenoids was 13.2 years and that of those who had had them removed was 14.1 years.

For the children with tonsils and adenoids (table 3) the duration of the colds was 4.23 days per person, and for those whose tonsils and adenoids had been removed it was 2.67 days per person.

Forty-one per cent of the children whose tonsils were present had colds of short duration (one and two days), whereas 60 per cent of the children whose tonsils had been removed had colds of such short duration.

COMMENT

Although the total number of children with common colds during the period studied was only moderate, the close similarity of incidence and severity of colds in the treated and in the untreated group apparently indicates that the gamma globulin was of no value in local therapy. There was a difference between the duration of colds of the children whose tonsils and adenoids were present and the duration of colds of the children whose tonsils and adenoids had been removed: The latter group had colds of shorter duration. However, statistically this difference was not highly significant.[11] The possible importance of this would appear to be increased by the fact that those children who were recognized as susceptible to infections of the upper respiratory tract were the ones with a higher number of tonsillectomies. This fact obviously would unfavorably weight the data on the duration of colds against the children whose tonsils had been removed, whereas the present evidence apparently indicates that these children actually had colds of lessened severity. The relation of secondary bacterial invaders to such a result cannot at this time be evaluated, inasmuch as routine bacterial cultures were not obtained.

SUMMARY

Human serum immune globulin was used intranasally by local instillation for the purpose of determining its effect in the treatment of the common cold.

11. Statistical analysis showed that there was 1 chance in 7 that this difference might be due merely to random sampling.

Objective criteria for the duration and severity of colds were used in the study of 70 children with the common cold, who were divided by chance as far as possible into a treated and an untreated group.

The duration and severity of the common cold in these two groups were closely similar, thus indicating no apparent effect of the gamma globulin in therapy by the method of instillation used.

Similar treatment of a smaller group of children with subacute sinusitis was also ineffective, although the number was too small to be significant.

The presence or absence of tonsils and adenoids may have influenced the duration of the common cold. For those children whose tonsils and adenoids were present the mean duration of the common cold was greater. This finding is not highly significant statistically.

5 East Chestnut Avenue.

The officials of the Pennsylvania School for the Deaf assisted in this study.

PLASTIC SURGERY OF THE SEPTUM IN CONJUNCTION WITH RHINO-OSTEOPLASTY

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ANTERIOR deformities of the septum require complete exposure of the skeletal structures of the nose for correction. Such a procedure is necessary in order that the septum may be disengaged from its attachments. The usual route used for a submucous resection is applicable to correction of a central or posterior deflection. However, this technic without skeletal exposure does not allow for correction of a pronounced anterior deformity.

Of late, controversial thought has arisen concerning the role of the anterior cartilaginous portion of the septum. The anterior portion of the septum plays a definite role in supporting the nose. The lower lateral cartilages and the alae aid in this support.

It is not uncommon to see cases in which the septum inadvertently has been removed at operation or destroyed by disease, with the result that the nose is collapsed. This flattening is due to lack of cartilaginous septum and not to scars or adhesions.

Merely that the anterior portion of the septum is twisted or bent is not always an indication for its removal and replacement with necrocartilage. Admittedly, in some instances the septum is so badly distorted that such an operation may be required to gain functional and cosmetic improvement[1]; prior to introducing such a procedure, however, other technics in which the patient's own cartilage is utilized should be considered.

When a posterior deviation is mechanically blocking the nasal passage and interfering with function, a thorough submucous resection may be required. The timing of the operation in relation to a rhinoosteoplasty will depend on the kind of deformity and on whether or not it occurs with a gross anterior deflection. The submucous resection is sometimes made before the rhino-osteoplasty or in conjunction with or after it.

If the septal deviation is confined to an area posterior and inferior, the correction may be performed prior to the rhino-osteoplasty. If the

1. Lamont, E. S.: Am. J. Surg. **69**:144-154 (Aug.) 1945.

deviation is posterior and superior, it may be corrected afterward, to avoid a collapse of the septal structures when the bony dorsum is separated. Should a posterior deviation occur in conjunction with an anterior deformity, then the submucous resection in conjunction with a rhino-osteoplasty may be necessitated. In such cases, some of the resected cartilage may be employed for the anterior grafts, as struts.

These suggestions are not necessarily fixed rules; judgment will depend on the deformity in each case. In many cases, the operation on the septum must be performed together with the rhino-osteoplasty, in order that justice may be done to each procedure.

Numerous operators [2] have proposed surgical methods of correcting an anterior deformity of the septum. These methods have consisted of (1) removing a sliver of cartilage at the point of convexity, thus creating a "swinging door" from the distal portion of the septum, and placing it in the midline; (2) resecting the anterior defect and utilizing a section of the posterior portion of the septal cartilage in its place; (3) removing the entire anterior deformity and replacing it with a cartilage plate; (4) holding the deflection in position by running a guy wire through it and wiring the other end to a tooth, and (5) transfixing the nose and employing an Asch forceps to rock the septum loose and place it in a midline position.

Each of these procedures has served its purpose in the hands of its originator and is applicable in individual cases. The purpose of this paper is to demonstrate that in many cases of exaggerated deformity of the anterior portion of the septum one or a combination of the various technics is often required, depending on the deformity.

Most patients with a decided anterior deformity of the septum also present a crooked nose. Injuries causing such a defect often occur in childhood, with resultant deformity of the bony dorsum and the upper

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2. Aufricht, G.: A Few Hints and Surgical Details in Rhinoplasty, Laryngoscope **53**:317 (May) 1943. Brown, J. B.: Reconstructive Surgery of the Nose, in Nelson's Loose-Leaf Surgery, New York, Thos. Nelson & Sons, 1940, vol. 8, chap. 2, pp. 237-266. Byars, L. T.: Surgical Correction of Nasal Deformities, Surg., Gynec. & Obst. **84**:65-78 (Jan.) 1947. Eisenstodt, L. W.: Management of Septal Deformities in Rhinoplastic Correction, Arch. Otolaryng. **45**:77-89 (Jan.) 1947. King, E. D.: Personal communication to the author. Lamont, E. S.: Physiology of the Nose and Its Relation to Plastic Surgery, Am. J. Surg. **72**:238-245 (Aug.) 1946, footnote 1. Maliniac, J. W.: Rhinoplasty and Restoration of Facial Contour, Philadelphia, F. A. Davis Company, 1947. Peer, L. A.: An Operation to Repair Lateral Displacement of the Lower Border of the Septal Cartilage, Arch. Otolaryng. **25**:475-477 (April) 1937. Pickrell, K. L.: Nasal Deformities and Their Repair, Surgery **20**:845-863 (Dec.) 1946. Seltzer, A. P.: The Nasal Septum, Arch. Otolaryng. **40**:433-444 (Dec.) 1944. Sheehan, J. E.: Plastic Surgery of the Nose, New York, Paul B. Hoeber, Inc., 1936. Steffensen, W. H.: Reconstruction of the Nasal Septum, Plast. & Reconstruct. Surg. **2**:66-71 (Jan.) 1947.

Fig. 1.—*A* and *C*, old fracture of the nose. The septum was greatly deviated, virtually blocking both nasal passages. The anterior portion of the septum was dislocated. Rhino-osteoplasty in conjunction with the septal operation was required for correction. *B* and *D*, three months after operation. A thorough submucous resection had been performed, leaving the anterior septal cartilage intact. The latter was used as a "swinging door," with its distal end inserted between the separated crura of the lower lateral cartilages.

and lower lateral cartilages. In such cases, from necessity, I reconstruct the nose as weii as the septum, so that the patient gains both physiologic and cosmetic improvement (figs. 1 to 9).

Prior to operation, a careful history is taken and a thorough physical examination is made. In spite of the physical blockage of the

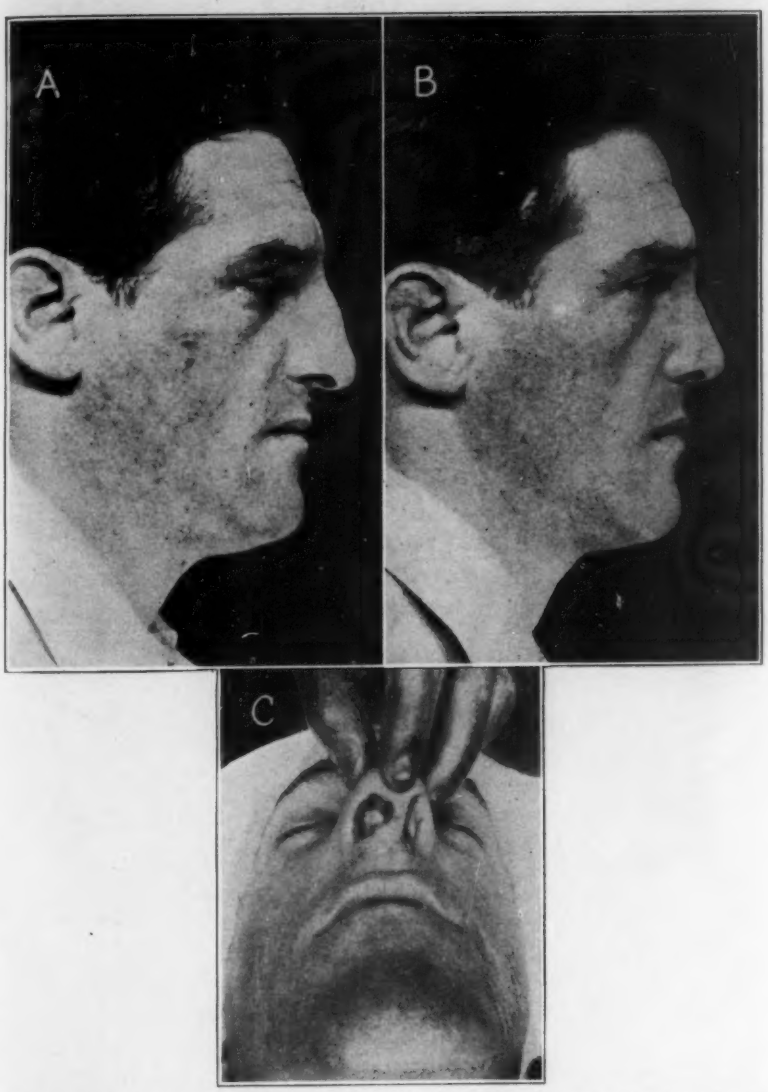

Fig. 2.—*A* and *C*, old fracture of the nose and congenital deformity. The septum was deviated, blocking the nasal passages. Rhino-osteoplasty and reconstruction of the septum were necessitated. (*B*) Beginning at the septal-columellar juncture, the mucous mebrane flap was undermined on each side and a complete submucous resection carried out. Salvaged cartilage was used to insert an anterior strut and a strut extending from the tip to the nasal spine between the separated medial crura of the lower lateral cartilages. A small piece of cartilage was implanted at the philtrum-columella angle.

Fig. 3.—*A*, *C* and *E*, congenital deformity of the nose and septal deviation. *B* and *D*, A "swinging door" procedure was carried out on the anterior septum by removing a sliver of cartilage at the angle of convexity and undermining the mucous membrane flap on either side proximally. The distal end of the septum was shaved the required amount and inserted between the separated halves of the medial crura of the lower lateral cartilages. The rhino-osteoplasty was performed conjointly.

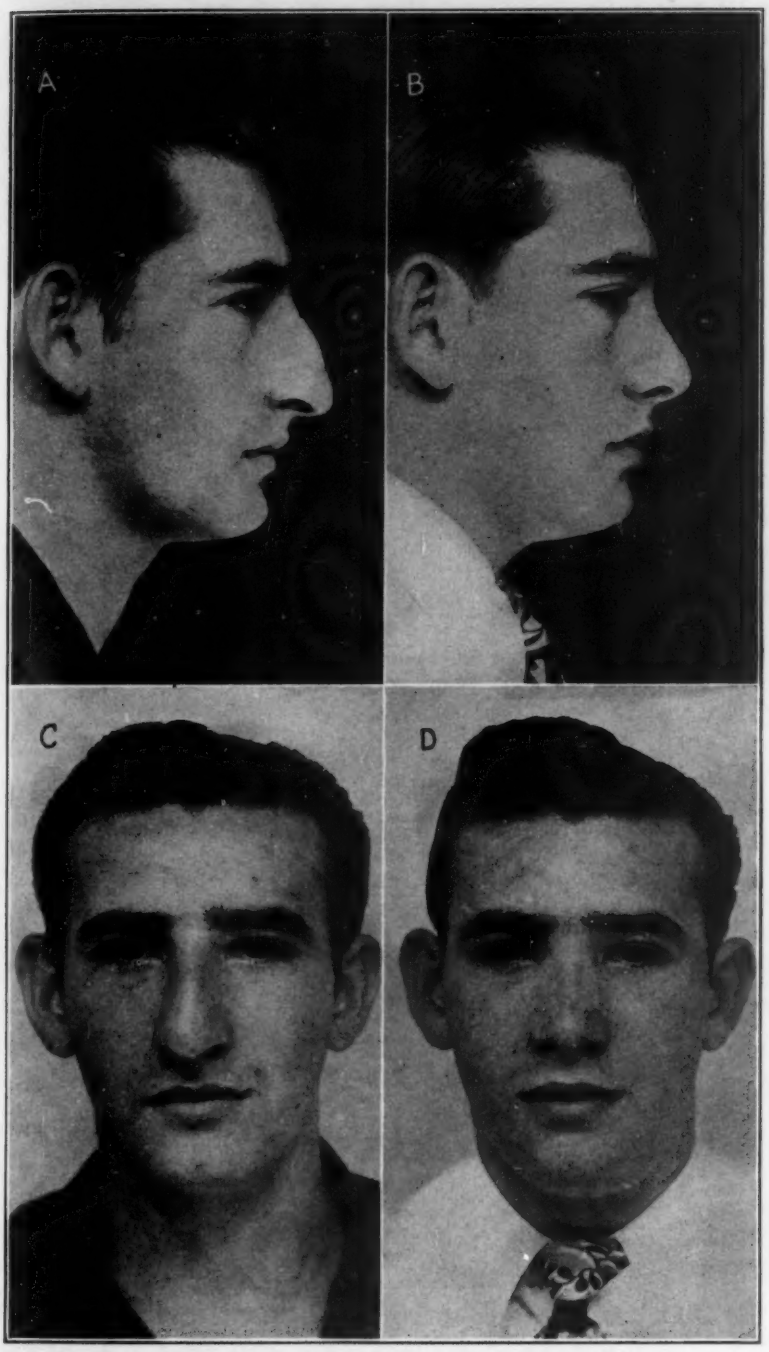

Fig. 4.—*A* and *C*, congenital deformity of the nose and septal deviation. *B* and *D*, four months after septal repair and reconstruction of the nose. The septum in this case was dislocated, and after it was disengaged during the rhinoosteoplastic procedure, an Asch forceps was used to straighten the bony and cartilaginous septum.

Fig. 5.—*A*, *C* and *E*, congenital deformity of the nose and old fracture. The septum was extremely deviated, blocking both nasal passages. Reparative surgery of the nose and the septum was required. (*B* and *D*) The mucous membrane flap was undermined on either side, beginning at the columella-septum juncture. Because of the complete deformity of the cartilage, the septum was resected. Sufficient septal cartilage was salvaged to create an anterior and inferior strut.

septum, the surgeon should be watchful for the presence of nasal allergy and its consequences. Smears of the nasal secretions may be helpful. Allergic rhinitis may continue to block the nose in spite of

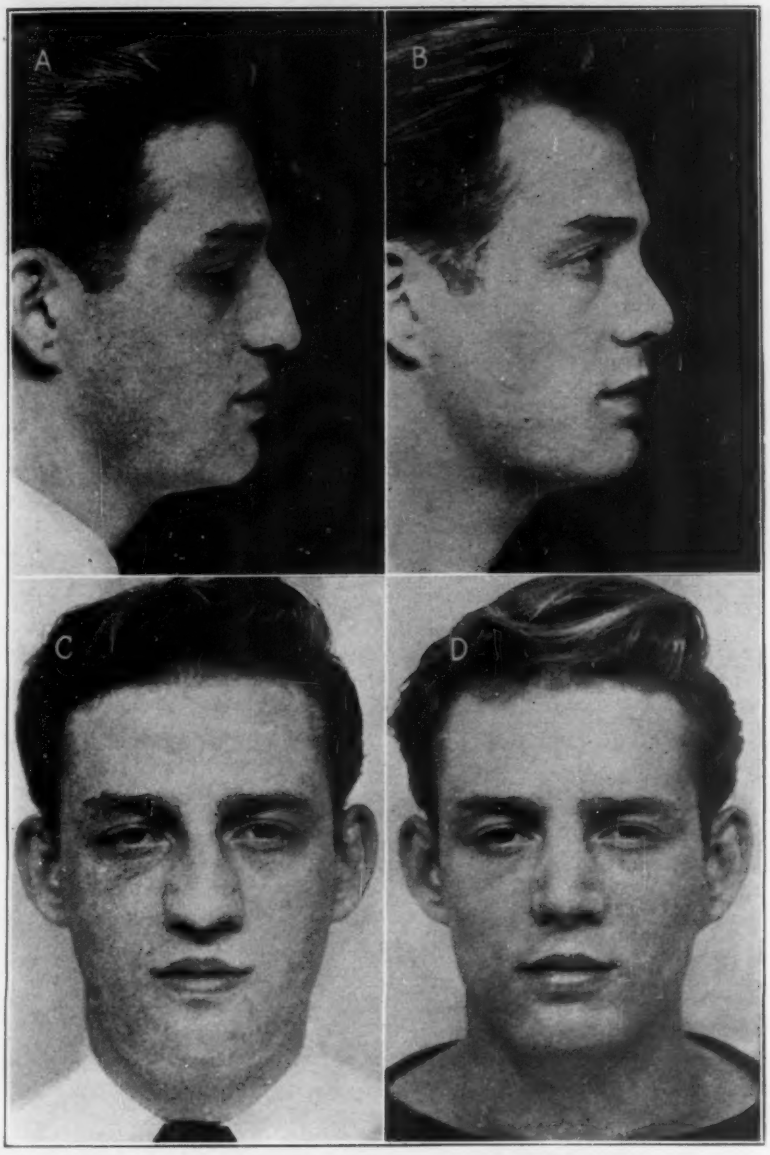

Fig. 6.—*A* and *C*, old fracture of the nose. At other hands, a submucous resection had been done, including removal of the anterior cartilaginous septum. This had caused further collapse of the nose. (*B* and *D*) A rhino-osteoplasty was carried out. The mucous membrane flaps of the septum were separated, and a necrocartilage plate was inserted with its distal end inveterated between the separated medial crura of the lower lateral cartilages. A small piece of cartilage was implanted at the columella-philtrum juncture to overcome the sharp angle.

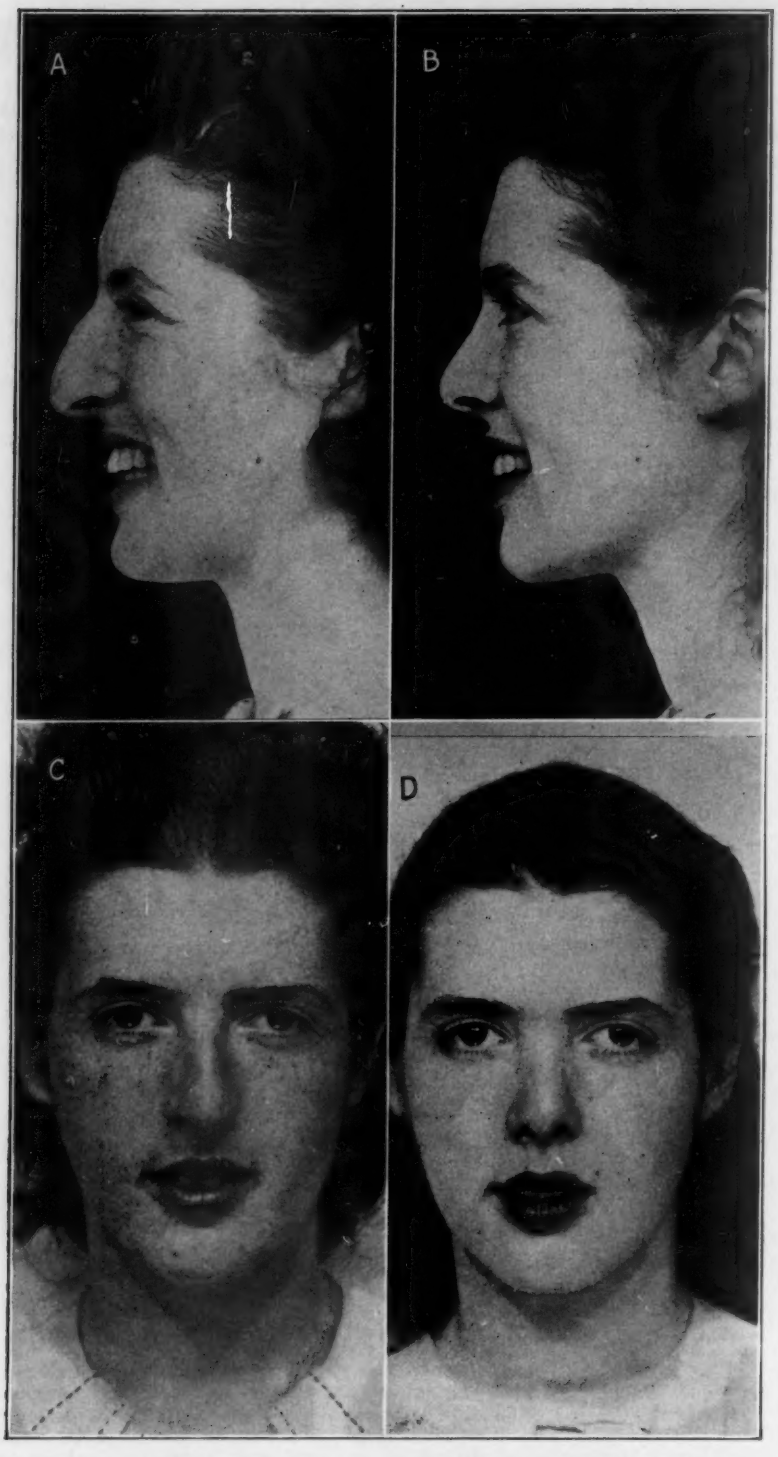

Fig. 7.—*A* and *C*, congenital deformity of the nose and deviated septum. *B* and *D*, two months after rhino-osteoplasty and submucous resection. The two operations were done at the same time, since the deviation was posterior and inferior.

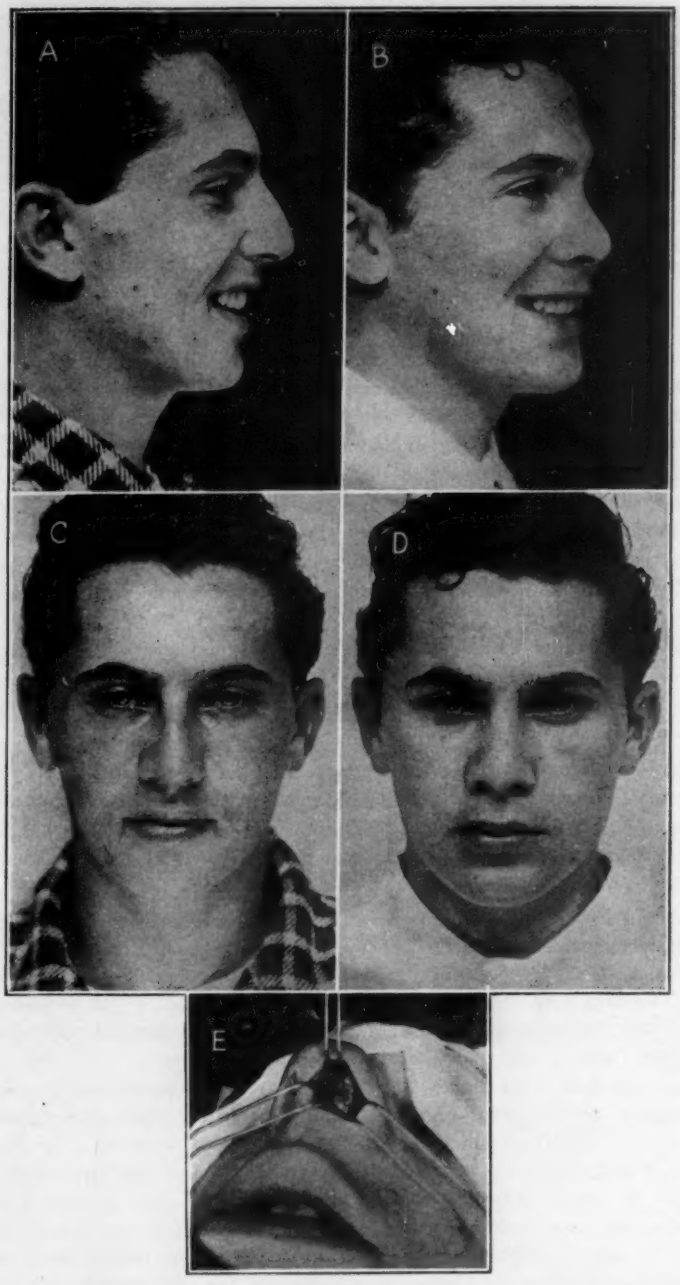

Fig. 8.—*A, C* and E, old fracture of the nose. An anterior deviation of the septum required reconstruction, in conjunction with the rhino-osteoplasty. (*B* and *D*) A "swinging door" procedure was carried out on the anterior deviation by undermining the mucous membrane away from the convex side of the septum and removing a sliver of cartilage at the point of convexity. The undermining of the mucous membrane was continued onto the vomer on both sides, thus overcoming the pull on the "swinging door."

ideal surgical measures. Such a discovery after operation, without forewarning, may cause embarrassment to the surgeon and unhappiness to the patient. Preoperative photographs, as well as a moulage of the patient's face, are made. Complete laboratory work is a prerequisite.

The following cases are presented as illustrative of nasal deformity, in conjunction with an exaggerated anterior deviation of the septum.

REPORT OF CASES

CASE 1.—R. W., a white woman, had sustained a severe injury to the nose when struck with a ball at the age of 10. There was no history of allergy (fig. 5).

Physical Examination.—Internal examination revealed a pronounced anterior convexity of the septum on the right side. At the posterior aspect of the vestibule, the septum was actually in contact with the lateral wall of the nose. The septum turned at a sharp right angle, so that on the left side, more posteriorly, it was in contact with the lateral wall of the nose. The inferior turbinate body on the right was enlarged and bulged into the posterior aspect of the septal convexity. The turbinate bodies shrank easily with shrinking solution, and with a speculum gently spreading the left nostril the patient was able to gain air. Posterior to the deformity, the septum was straight except that the whole wall was dislocated about 3 mm. to the left.

External inspection revealed a prominent dorsal hump, with a sharp protrusion of the bony edge on the right side. The whole nose was deviated from the midline to the right. There was a small scar over the dorsum. The tip was bulbous and dropped.

Laboratory Examination.—Nasal smears did not reveal eosinophils. The urine was normal. Reactions to the Eagle flocculation test and the Kahn test were negative. A blood count showed 5,200,000 red cells and 8,900 white cells, a hemoglobin content of 87 per cent and a normal differential count. The bleeding time was three minutes; the clotting time, five minutes.

Surgical Procedure.—With preoperative medication and local anesthesia, incisions were made between the upper and the lower lateral cartilages bilaterally and brought forward, separating the septum from the columella down to the nasal spine. The skin over the nose was thoroughly undermined. The periosteum was reflected and the required amount of bony hump was removed with right and left bayonet saws.

The upper lateral cartilages were severed from the septum at an angle and a triangular section was resected from each upper lateral cartilage (see "Comment"). The anterior aspect of the septum was lowered. A chisel was inserted between the ethmoid plate and the nasal bones on each side, and a small triangular section of bone was removed near the glabella.

An incision was made along the lower border of the lower lateral cartilage, freeing the lateral aspect, the dome and a portion of the medial crus. Since it was desired to decrease the anteroposterior dimensions of the nasal tip, the cartilage, including mucous membrane, was cut through, medially and below the arch. A hocky stick section was resected from the lateral crus of the lower lateral cartilage on each side. The lateral crura were allowed to slide medially and were sewn back into position with black silk. The medial crura were separated,

so as to form a groove between the two members, and were thus prepared to accept a cartilage graft.

The anterior aspect of the septum was thick, twisted and curled, precluding a "swinging door" procedure for its correction. The mucous membrane flap on either side of the cartilage was carefully dissected away, past the convexity on the one side and the concavity on the other, the dissection continuing past the vomer. The anterior aspect of the distorted septum was removed, the section extending back approximately ¾ inch (1.91 cm.).

An Asch forceps was introduced submucosally and the posterior portion of the septum was moved to the midline. A swivel knife was introduced, and the posterior inferior aspect of the septal cartilage was resected in a block, to be used as a graft. The septal cartilage was cut to the desired dimensions and inserted along the lower anterior dorsum of the nose, with one end in contact with the remaining dorsal portion of the cartilaginous septum and the other inserted between the severed medial crura of the upper lateral cartilages. Thus, a continuous strut along the dorsum of the nose was created. The proximal end of the graft was sutured to the remaining septum with two 00000 surgical gut sutures. The distal end was transfixed in position by passing a silk suture through the medial crus of each lower lateral cartilage, the cartilage graft, the opposite crus, then back again near the same route.

A straight piece of cartilage, salvaged from the anterior aspect of the septum, originally resected, was jockeyed into position between the medial crura of the lower lateral cartilages. Two through and through silk sutures of black silk in the columella fixed it in position. Above, it was in contact with the dorsal cartilaginous graft; below, with the nasal spine.

The mucous membrane flaps on either side of the septum were placed back to their original residence, trimmed and then separately sutured to each side of the columella. Three staggered silk sutures were placed through and through in key positions to aid in adherence of the flaps.

Through separate incisions in the vestibule of the nose, angle saws were passed. The ascending processes of the maxillary bones were partially sawn through and then deflected medially to form the new arch. The nostrils were carefully packed. A metal splint and adhesive dressing were applied. Three days later the packs were removed and the external support was replaced with a smaller adhesive dressing. The course was uneventful, and the patient gained both cosmetic and physiologic improvement.

CASE 2.—L. J., a white woman, sustained a fracture of the nose during childhood and had been a "mouth breather" ever since. There was no history of allergy (fig. 9).

Physical Examination.—The septum presented a sharp convexity on the right side, about 5/8 inch (1.59 cm.) posteriorly, with the septum resting against the lateral wall of the nose. The septum then turned to the left side at almost a right angle, passing over to touch the lower turbinate body. Posterior to this sharp convexity, both lateral turbinate bodies were swollen and shrank only moderately with shrinking solution. The posterior aspect of the septum, though straight, was sharply dislocated to the right, meeting the anterior convexity at the lateral wall of the nose.

Externally, the dorsum presented a bony and cartilaginous hump. The entire nose curved to the right. The tip was bulbous and dropped, with a hanging columella.

Fig. 9.—*A*, *C* and *E*, congenital deformity of the nose and deviation of the anterior septum. (*B* and *D*,) Rhino-osteoplasty was performed in conjunction with a "swinging door" procedure applied to the anterior portion of the septum. The distal end of the septum was inserted between the separated halves of the medial crura of the lower lateral cartilages.

Laboratory Examination.—Nasal smears did not reveal eosinophils. The urine was normal. Reactions to the Eagle flocculation test and the Kahn test were negative. The blood count showed 4,600,000 red cells and 9,000 white cells and 81 per cent hemoglobin. The bleeding time was two minutes; the clotting time, three and one-half minutes.

Surgical Procedure.—The incisions were made between the upper and the lower lateral cartilages and brought forward, separating the septum from the columella down to the nasal spine. The skin over the nose was thoroughly undermined. The periosteum was reflected. A glabellar elevator was used to smooth the glabella. The required amount of hump was resected with bayonet saws. The upper lateral cartilages were severed from the septum and a triangular section was removed from each side. A chisel was introduced between the ethmoid plate and the nasal bones on each side and a small triangular section of bone was removed near the glabella. The anterior aspect of the septum was lowered the required amount. The mucous membrane was reflected from the right side of the septum, past the convexity. A sliver of cartilage, 2 mm. wide, was resected from the septum at the point of convexity, the section extending from the dorsal aspect to its base. The distal portion of septum, thus created, served as a "swinging door."

Incisions were made along the lower border of the lower lateral cartilage on each side, allowing the lateral crus, the dome and a section of medial crus to be undermined. The cartilages were cut through slightly below the arch, and a hockey stick section was resected from the lateral crura. The lateral crura were allowed to slide medially and were sewn into position with black silk. The mucous membrane on either side of the septum was undermined past the vomer. An Asch forceps was introduced submucosally, and the posterior bony and cartilaginous septum was rocked loose, so that it could easily be set in the midline.

The distal anterior septal "swinging door" was implanted between the medial crura of the lower lateral cartilages (that had been separated previously by dissection), thus creating a strut within the tip. A through and trough tip suture was taken between the tip of either wing of the medial crus of the lower lateral cartilages, and the septal cartilage between them.

The mucous membrane flaps on either side were laid back into position and sewn to the columella with interrupted black silk sutures. Three staggered sutures were taken through and through the flaps and cartilage to aid in their adherence.

Through separate incisions at the lateral aspect of the vestibule of the nose, bayonet saws were entered. The ascending processes of the maxillary bones were partially sawn through and reflected medially to form the new bony arch.

An accordion pack was placed in each side of the nose; a metal splint and adhesive dressing were applied externally. The packing was removed in three days, and at the time of writing the patient had obtained both functional and cosmetic improvement.

COMMENT

When a rhino-osteoplasty is performed in conjunction with a reparative operation on the severely fractured septum, not only is sufficient exposure obtained, but the external nasal deformity can be simultaneously corrected.

In my experience, an implant, whether it be of cartilage or bone, does not necessarily preclude the performance of the rhino-osteoplasty.

In only the exceptional case of a prominent anterior septal deformity is it necessary to remove the whole section and replace it with necrocartilage. Should the septum be so thickened and twisted that it cannot be readily maneuvered into a functional position, portions of it may be salvaged, or septal cartilage posterior to this deformity may be utilized to gain the desired result. During the past years, I have used necrocartilage plates to replace the anterior cartilaginous septum. In these instances the septum had been previously removed and discarded by other surgeons.

Saddle deformity may be repaired by introducing a sculptured cartilage graft, either homogenous or autogenous; bone, and sometimes foreign materials, such as acrylic resin, may be used judiciously.

Cancellous bone taken from the lip of the ilium and sculptured to the desired dimensions by an electric burr may be introduced intranasally as a dorsal graft.[2]

When the dorsal hump is removed with bayonet saws, in most cases a minimum amount of bone is resected. After this a chisel is introduced between the ethmoid plate and the nasal bones and a small triangle of bone is resected from the apex on each side. A narrow rasp is then entered and the ethmoid plate is lowered between the two nasal arches. The purpose of this technic is twofold: First, when the ascending processes of the maxillary bones are sawn through and the distal fragments deflected medially, a bony dorsum is obtained that is not too flat; second, if the ethmoid plate is lowered, as described, the bony arches, when deflected to the center, become confluent, without the ethmoid plate extending up between them. Thus, a more apical and smoother bridge is obtained.

Though many operators have sufficiently good reasons for removing a small piece of lower lateral cartilage submucosally, without undermining, it has been my policy to carry out this procedure more extensively. An incision is made along the lower border of the lower lateral cartilage and is projected laterally, slightly past the lateral border of the cartilage. Medially, the incision is carried past the dome about 2 mm. onto the columella. This allows the lower lateral cartilage to be freed from its bed. In cases in which it is not desired to make the nostrils smaller, the requisite amount of lower lateral cartilage is removed submucosally, as a hockey stick, leaving the mucous membrane intact. The lateral crus is undermined from the mucous membrane and allowed to slide medially. The edge of the mucous membrane is carefully sutured back to its border.

In cases in which it is desired to make the nostrils smaller, a hockey stick of cartilage is removed with mucous membrane. The lateral crus is undermined and allowed to slide medially and the mucous membrane is carefully sutured back into position. In each case, a through and

through suture with silk is taken at the tip of the medial crura. Such a procedure does not result in scar contractures or adhesions at the angle tip of the nasal vestibule. It is my belief that this procedure also overcomes the "pinching" of the ala that is often present when a piece of lower lateral cartilage has been removed and no effort has been made to allow the lateral crus to slide medially toward the tip and overcome the hiatus. When the lateral crus is undermined sufficiently and its border carefully sutured to the desired position, the possibility of scar contracture within the tip is excluded and the desired contour is obtained.

When the skin over the nose is undermined thoroughly, rather than being loosened only over the central dorsum, it contracts more uniformly in accepting the smaller reconstructed skeletal structures.

The through and through tip suture placed between the upper ends of the medial crura of the lower lateral cartilages creates a more stable tip and simultaneously eliminates the possibility of these ends following their inclination to curl outward and present a "horn" on either side of the tip.

Often, in collapsed noses with a flattening of the upper lateral cartilages, severing of the cartilages from the septum at their apex will include mucous membrane that is required. Therefore, the scissors is entered at an angle about 3 mm. lateral to the apex. The upper lateral cartilages are severed from the septum, and the wings of the upper lateral cartilages remaining on the septum may then be resected submucosally. Thus, the remaining mucous membrane on each side is brought medially to cover the septum or the required graft.

In cases of a disappearing posterior columella and a "dish face" upper lip, which often occurs with a fractured, dislocated septum, a small piece of cartilage may be inserted in the columella-philtrum angle through a short incision in the base of the columella within the nose.

SUMMARY

Several cases from a series are presented, illustrating the reconstruction of deformities of the anterior portion of the nasal septum. These deformities may be corrected in conjunction with a rhinoosteoplasty by one or a combination of a variety of procedures. The technic used will depend on the type of deformity. Such an approach allows for both cosmetic and physiologic repair.

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BRONCHOGENIC CARCINOMA

Review of Three Hundred and Sixteen Cases, from 1937 to 1946

MAX M. KULVIN, M.D.
HINES, ILL.

DURING the ten year period between 1936 and 1947, when it was my privilege to serve as chief of the eye, ear, nose and throat service at the Veterans Hospital at Hines, Ill., I carried out almost all the endoscopies myself. This report represents a study of bronchial carcinoma, as determined by bronchoscopy, clinical evidence and autopsy, and does not include studies of any other nonmalignant growths which were seen bronchoscopically. Treatment of this tumor is not particularly stressed, as it did not come within the scope of this report.

The incidence of bronchogenic carcinoma reported here varies to some extent from that reported by other authors. Owing to the possibility of there being greater concentration in this hospital of patients of the tumor age, and owing to the fact that patients suspected of having a tumor of any kind would tend to be concentrated at the Hines Veterans Hospital, the statistics from this hospital are somewhat higher than those in the usual reports.

Steiner [1] reported that in a series of 5,515 necropsies 10.3 per cent of all the tumors found were classified as carcinoma. He found that 7.6 per cent of all malignant neoplasms arose in the bronchi. Bronchogenic carcinoma was noted in 0.99 per cent of all autopsies. From the studies made at the University of Chicago, bronchogenic carcinoma was third in frequency of all carcinomas found at autopsy.

Jaffee, cited by Ochsner, Dixon and DeBakey,[2] found carcinomas in 871, or 12.8 per cent, of 6,800 autopsies; of this number, 11.47 per cent represented bronchogenic carcinoma, and this frequency was next to that of carcinoma of the stomach and intestine. Holleb, cited by Ochsner, Dixon and DeBakey,[2] found bronchogenic carcinoma in 14.71 per cent of all carcinomas observed at autopsy, while bronchogenic

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1. Steiner, P. E.: Primary Carcinoma of Lung, Arch. Path. **37**:185 (March) 1944.

2. Ochsner, A.; Dixon, J. L., and DeBakey, M.: Symposium on Thoracic Surgery: Primary Bronchogenic Carcinoma, Clinics **3**:1187 (Feb.) 1945.

carcinoma was found in 2.41 per cent of all autopsies performed. Matz,[3] in 1938, noted that the relative incidence of bronchogenic carcinoma to that of all carcinoma observed at autopsy at the veterans hospitals was 6.4 per cent from 1927 to 1931 and 23.4 per cent in 1937.

Brunn,[4] in analyzing the data on 192,271 autopsies, found the incidence of bronchogenic carcinoma to be 0.24 per cent.

Rogers [5] noted the incidence of bronchogenic carcinoma to be 2.26 per cent of 2,209 necropsies. Rosedale and McKay,[6] in a series of 4,670 necropsies, found carcinoma in 10 per cent, in 7.5 per cent of which it arose in the bronchi.

Our observations showed 1,929 carcinomas in a total of 4,215 autopsies, an incidence of 45.7 per cent. Bronchogenic carcinoma was present in 130 cases, or in 6.7 per cent of all malignant growths found at autopsy. In only 93, or 4.8 per cent, of all carcinomas found at autopsy did biopsy show malignancy. This incidence amounted to 2.2 per cent of all autopsies.

ANALYSIS OF MATERIAL

Sex.—Since the Veterans Hospital is an institution for ex-servicemen only, the patients observed were all men. It is true that World War I had a limited number of women on duty, but none admitted to the hospital had bronchogenic carcinoma. Women in service in World War II do not figure in this report, since this paper represents studies on veterans of World War I for the most part, made before veterans of World War II began to come into the hospital. Other investigators also found the vast majority of patients to be men. Björk [7] found an incidence of 90 per cent in men and of 10 per cent in women. Ochsner [2] found an incidence of 75 per cent in men and 25 per cent in women. Holinger, Hara and Hirsch [8] reported an incidence of 87 per cent in men and 13 per cent in women. Moersch and Tinney,[9] in a study of 448 patients,

3. Matz, P.: Incidence of Primary Bronchogenic Carcinoma, J. A. M. A. **111**:2086 (Dec. 3) 1938.

4. Brunn, H.: Primary Carcinoma of Lung, Arch. Surg. **12**:406 (Jan.) 1926.

5. Rogers, W. L.: Primary Cancer of Lung: Clinical and Pathological Survey of Fifty Cases, Arch. Int. Med. **49**:1058 (June) 1932.

6. Rosedale, R. S., and McKay, D. R.: A Study of Fifty-Seven Cases of Bronchogenic Carcinoma, Am. J. Cancer **23**:754 (March) 1935.

7. Björk, V. O.: Bronchogenic Carcinoma, Acta chir. Scandinav. (supp. 123) **95**:1, 1947.

8. Holinger, P. H.; Hara, H. J., and Hirsch, E. F.: Bronchogenic Carcinoma: Analysis of One Hundred and Seventy-Five Proved Cases, Ann. Otol., Rhin. & Laryng. **54**:5 (March) 1945.

9. Moersch, H. J., and Tinney, W. S.: Carcinoma of Lungs, Minnesota Med. **26**:1046 (Dec.) 1943.

found men predominating, in the ratio of 5:1. In Arkin and Wagner's [10] series of 135 patients, 125 were men and 10 were women. Jackson and Jackson [11] found an incidence of 87 per cent in men and 13 per cent in women, while Lederer [12] stated that his ratio was only 3 men to 1 woman.

Race.—The reports on the incidence of carcinoma in Negroes depend a great deal on the type of service the various authors conducted. Steiner [1] had 6 Negroes in his series of 128 patients. Quinland, cited by Holinger,[8] at the University of Chicago Clinics, had 3 Negroes among 74 patients. However, Halpert, cited by Holinger,[8] in New Orleans, reported an average of 1.5 white persons to 1 Negro among his patients. Arkin and Wagner [10] found that Negroes constituted about 9.5 per cent of his patients. This corresponds exactly to our percentages. Other authors have not broken down their statistics

TABLE 1.—*Sex Incidence in Cases of Bronchogenic Carcinoma*

Author	Men, Percentage	Women, Percentage
Björk [7]	90.0	10.0
Ochsner, Dixon and DeBakey [2]	75.0	25.0
Holinger, Hara and Hirsch [8]	87.0	13.0
Moersch and Tinney [9]	83.5	16.5
Arkin and Wagner [10]	92.5	7.5
Steiner [1]	79.4	20.6
Jackson and Jackson [11]	87.0	13.0
Craver [18]	90.3	9.7
Kulvin	100.0	0.0

according to race. In our series of 316 patients, 31 were Negroes and 285 were white persons. Our incidence of the disease among Negroes hospitalized was larger because of a fairly large Negro patient load.

Age.—Carcinoma is a disease of advanced years, the greatest percentage occurring in the middle decades of life. The youngest patient on record, in whom a metastatic nodule was found at the age of 10 months, was that of McAldowie, reported by Ochsner.[2] Where the primary lesions lay, however, was not determined. Ochsner [2] stated that Brunn found 62 per cent of cases occurring between the ages of 40 and 60; Weller, the highest percentage occurring in the sixth or seventh decade; Olson, 73.8 per cent in the fifth, sixth and seventh decades; and Simons, 80 per cent between the ages of 40 and 70. The

10. Arkin, A., and Wagner, D.: Primary Carcinoma of Lungs, J. A. M. A. **106**:587 (Feb. 22) 1936.

11. Jackson, C., and Jackson, C. L.: Diseases of the Nose and Throat, Philadelphia, W. B. Saunders Company, 1946.

12. Lederer, F. L.: Diseases of the Ear, Nose and Throat, Philadelphia, F. A. Davis Company, 1944.

ages of Ochsner's own patients averaged 54 years, the oldest patient being 83 and the youngest 19. Steiner [1] showed an average age of 54.9, the oldest patient being 86 and the youngest 32. Björk [7] reported 98.3 per cent occurring after the age of 30 and 87.8 per cent at past the age of 40, peak period occurring at the age of 50 to 54. His youngest patient was 19. Lederer [12] reported that the highest percentage occurred between the ages of 40 and 60. Moersch and Tinney [9] noted an incidence of 80 per cent in patients more than 40 years of age. They also noted that below the age of 30 the incidence was about equal for men and women, but from then on, in each decade, the increase in frequency was greater among men. Holinger [8] reported an incidence of 43 per cent between the ages of 50 and 59 and of 72 per cent between the ages of 45 and 64; Arkin [10] showed an incidence of 72 per cent between the ages of 41 and 60 and of 9 per cent between the ages of 21 and 40. Among our own patients, the youngest was 36 and the oldest 76, the

TABLE 2.—*Race Incidence in Cases of Bronchogenic Carcinoma*

Author	White Persons, Percentage	Negroes, Percentage
Steiner [1]	95.3	4.7
Arkin and Wagner [10]	91.0	9.0
Quinland [6]	96.0	4.0
Halpert [5]	60.0	40.0
Holinger and others [8]	99.5	0.5
Kulvin	90.2	9.8

average age being 52. Among 300 patients, Jackson and Jackson [11] found that 1 patient was under 20 and 1 over 20 and that almost half (126, or 42 per cent) were in the sixth decade. An analysis of our age groups showed that 5 patients, or 1.5 per cent, were in the fourth decade; 161 patients, or 50.9 per cent, in the fifth decade; 130 patients, or 41.1 per cent, in the sixth decade, and 19 patients, or 6 per cent, in the seventh decade. Thus, 291, or 91 per cent, of the 316 patients were in the fifth and sixth decades, those of the peak group being in the sixth decade.

Site of Lesion.—The location of the lesion in the bronchi has been studied by many authors. Primary carcinoma appears at or near the hilus, growing from the main branches or their primary divisions. It has a distinct predilection for the right bronchus. This has been the experience of practically all the observers. Ochsner [2] stated that carcinoma involving the lung is almost entirely a disease of the bronchi, although rarely it may begin in the alveoli. Arkin,[10] on the other hand, stated that although the carcinoma arises in the trachea, bronchi or bronchioles, it does not arise in the alveoli, as they do not have an epithelial lining. Lederer [12] stated that bronchogenic carcinoma arises from the basal cell layers of epithelium and is never

primary in the alveoli because there is only a single layer of flattened epithelium at these sites. Holinger [8] observed the lesion oftener on the right side, in the proportion of 11 to 6. On the right side, it was found most commonly in the main bronchus, in 31.4 per cent; next most commonly in the lower lobe of the lung, in 19.4 per cent; in the upper lobe, in 10.8 per cent, and in the middle lobe, in 1.14 per cent. On the left side, the commonest site was the main bronchus, in 15.4 per cent; next, the lower lobe, in 13.1 per cent, and, last, the upper lobe, in 8.6 per cent. Moersch and Tinney,[9] in 363 cases, found the right side to be involved twice as frequently as the left. On the right side, they found that in 24.5 per cent of cases the main bronchus was involved; in 13.5 per cent, the upper bronchus; in 26.7 per cent, the lower bronchus, and in 1.65 per cent, the middle bronchus. On the left side, the main bronchus was involved in 16 per cent, the upper

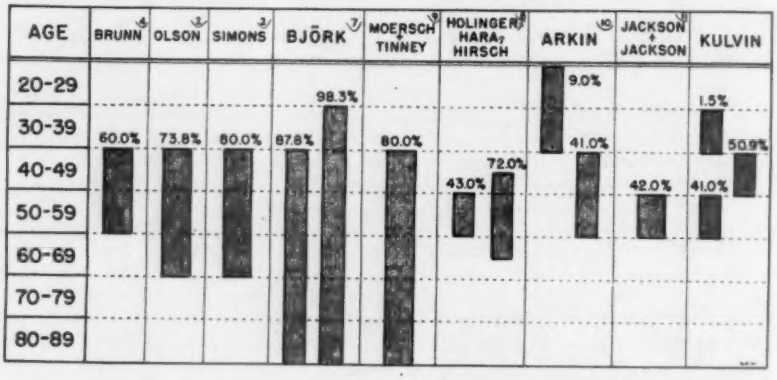

Chart 1.—Incidence of age in cases of bronchogenic carcinoma.

lobe in 7.5 per cent and the lower lobe in 10 per cent of cases. Brindley Jr.,[13] at the Mayo Clinic, in reviewing 90 cases, found that the right upper bronchus was involved in 16.6 per cent of cases, the right lower bronchus in 21.1 per cent, the right main bronchus in 13.3 per cent, the left upper bronchus in 18.8 per cent, the left lower bronchus in 11.1 per cent and the left main bronchus in 18.8 per cent. The occurrences on the two sides were the same: 44 cases on the right and 46 on the left. Ochsner [2] found 4,732 cases reported in the literature, in 58.3 per cent of which the right side, and in 41.7 per cent the left side, was involved. Of 375 cases of Fisher, cited by Ochsner,[2] the right side was involved in 53 per cent and the left in 45 per cent, the involvement being bilateral in 2 per cent.

13. Brindley, G., Jr.: Pathologic Aspects of Bronchogenic Carcinoma, Proc. Staff Meet., Mayo Clin. **19**:361 (July 12) 1944.

Perrone and Levinson [14] found the right side involved in 65.7 per cent of cases and the left side in 34.2 per cent. The right main bronchus was involved in 7.7 per cent of cases, the right upper bronchus in 16.6 per cent, the right middle bronchus in 2.3 per cent and the right lower bronchus in 44.1 per cent. The left main bronchus was involved in 9.7 per cent of cases, the left upper in 5.2 per cent and the left lower bronchus in 11.6 per cent. The lower lobes of both lungs were involved in 1.4 per cent of cases, and the middle and lower lobes of the right lung, in 1.4 per cent. In Björk's [7] cases there was no definite predominance of one side over the other. He noted, however, that carcinoma of the upper lobe was found in 58.8 per cent and of the lower lobe in 38.4 per cent. Of our 316 cases, the right side was involved in 56.2 per cent and the left side in 43.9 per

TABLE 3.—*Site of Lesion*

		Right Bronchus				Left Bronchus			
Name	No. of Cases	Main, %	Upper, %	Middle, %	Lower, %	Main, %	Upper, %	Lower, %	Comment
Moersch and Tinney [9]	363	24.5	13.5	1.65	26.7	16.0	7.5	10.0	....
Brindley [12]	90	13.3	16.6	....	21.1	18.8	18.8	11.1	....
Pneumonectomized Patients									
			3.4%				6.9%		
Ochsner, Dixon and DeBakey [3]	190	....	24.1	3.4	24.1	....	17.2	12.1	....
Fisher [2]	375	19.0	20.0	2.0	15.3	15.3	17.4	14.0	....
Horn [17]	45	37.2	11.6	2.3	20.9	11.6	11.6	2.3	....
				1.4%					Bilateral
Perrone and Levinson [14]	...	7.7	16.6	2.3	44.1	9.7	5.2	11.6	1.4
Holinger, Hara and Hirsch [8]	151	31.4	10.8	1.14	19.4	11.4	8.6	13.1	....
Kulvin	316	....	28.4	5.5	22.3	....	25.8	18.1	....

cent. The right upper bronchus was found involved in 28.4 per cent of cases, the right middle bronchus in 5.5 per cent, the right lower bronchus in 22.3 per cent, the left upper bronchus in 25.8 per cent and the left lower bronchus in 18.1 per cent.

Symptoms.—A study of the symptoms was not made in detail, but it was noted that the cardinal ones were cough, pain in the chest, hemoptysis and dyspnea, associated with loss of weight, lassitude and hoarseness. Holinger,[8] in a detailed study, found cough in 87 per cent of cases, pain in the chest in 69 per cent, dyspnea in 55 per cent, expectoration in 47 per cent, hemoptysis in 47 per cent, loss of strength in 45 per cent, loss of weight in 41 per cent, anorexia in 28 per cent, fever in 27 per cent, night sweats in 20 per cent, wheezing in 13 per cent, hoarseness in 12 per cent, vomiting in 90 per cent and dysphagia in 4 per cent.

14. Perrone, J. A., and Levinson, J. P.: Primary Carcinoma of Lung, Ann. Int. Med. **17**:12 (July) 1942.

Diagnosis.—The diagnosis of bronchogenic tumor depends a great deal on the symptoms, correctly interpreted, associated with the clinical appearance of the bronchi and with the results of roentgenologic examination and confirmed, finally, by bronchoscopic examination, biopsy with histologic study, aspiration, biopsy of a node and operation. The vast majority of physicians contend that no diagnosis can be made unless a biopsy diagnosis of a malignant growth is established. Presumptive evidence of carcinoma of the lung is established by many clinicians, but they cannot be certain without a biopsy. Arkin [10] stated that in 51 per cent of the cases the signs and symptoms were predominantly referable to structures outside the lung. This explains, he said, the failure in most clinics to make a diagnosis in 50 per cent of cases. Bronchoscopy is of great value in confirming the diagnosis, but the condition in most cases, he contended, can be recognized without it. Perrone and Levinson [14] stated that in 80 per cent of the cases a biopsy specimen can be taken; however, in the remainder, fixation of the bronchus establishes the diagnosis. In fixation of the bronchus, mediastinal involvement has taken place, while extension into the trachea precludes surgical removal. Muller and Miller [15] likewise maintained that fixation and distortion of the bronchus indicate external involvement of the lungs and point toward nonresectability. Of 67 cases in which bronchoscopy was performed, there was positive evidence of malignancy in 49; in only 35 of these 49 cases was the lesion evident; in 14 there was no lesion, but other evidence of invasion of the lung was present. Jackson [11] stated that the lesion could be visualized in 75 per cent of cases. However, other aspects of bronchoscopy and the clinical picture must not be neglected in establishing a diagnosis. Holinger [8] made a diagnosis by biopsy of a specimen taken through the bronchoscope in 78.4 per cent of cases. Ochsner [2] stated that in 70 per cent of cases adequate bronchoscopic biopsy should be possible. Moersch [16] concluded that in only 70 to 75 per cent of cases can a positive diagnosis be made from bronchoscopic biopsy, since in about 25 per cent of cases the lesion is in the deeper sections of the bronchi, which cannot be reached. Björk [7] made a positive diagnosis from a biopsy specimen obtained through bronchoscopy in only 59 per cent of cases; King,[2] in 50 per cent of cases, and Brines,[2] in 50 per cent of cases. It is noteworthy that we were never able to obtain the staggering total percentage of positive biopsy diagnoses obtained by Holinger,[8] Perrone and Levinson,[14] Ochsner [2] and Moersch,[16]

15. Muller, G. P., and Miller, B. J.: Primary Carcinoma of Bronchus: Its Pathology, Symptomatology, Diagnosis and Treatment, Clinics **4**:42 (June) 1945.

16. Moersch, H. J.: Diagnostic Aspects of Bronchogenic Carcinoma, Proc. Staff Meet., Mayo Clin. **19**:357 (July 12) 1944.

but fell, rather, into the same category as Björk,[7] King [2] and Brines,[2] with a moderate percentage of positive biopsy diagnosis.

Of our series of 316 cases, in only 181, or 57.2 per cent, could a biopsy specimen be taken, and in only 130, or 41 per cent, of the total number of cases was the diagnosis of carcinoma confirmed by autopsy or clinical evidence. In only 93 of the 130 biopsies, or in 71.6 per cent, was a positive diagnosis made and confirmed by autopsy. The diagnosis in the remaining cases was obtained by means of roentgenograms, history, physical findings and appearance of the bronchi, though biopsies were not made. Of the 82 cases in which the biopsy specimens obtained through bronchoscopy were found on histologic examination not to be malignant, the positive diagnosis was established by autopsy in 26 and by clinical findings in 56.

Histologic Features of Lesions.—Ochsner [2] stated that there are three types of cells: (1) cylindric, (2) squamous and (3) reserve, or parent cell, from which the cylindric cells are replenished. The reserve cells lie beneath the cylindric cells and are lined up along the border, toward the tunica propria. Halpert [2] stated that these reserve cells are the progenitors of bronchogenic carcinoma. They are round, elongated or polygonal and grow in solid masses, forming no particular structure. The cylindric cell carcinomas form tubular or acinar structures mounted in a papillary arrangement. The squamous cell carcinomas have a tendency to keratinization or pearl formation. In 135 cases reviewed by Halpert,[2] squamous cell carcinoma was found in 50 per cent, reserve cell carcinoma in 30 per cent and cylindric cell carcinoma in 20 per cent. In the series of Menne and Anderson,[2] 55.3 per cent were cases of squamous cell carcinoma; 23.2 per cent, cases of adenocarcinoma or cylindric cell carcinoma and 21.4 per cent cases of reserve cell, or oat cell, carcinoma. Holinger [8] reported 64 per cent of the squamous cell type, 17 per cent of the small round cell, or reserve cell, type, 13 per cent of the anaplastic type and 6 per cent of the cylindric cell type, or adenocarcinoma. Björk [7] classified the cells under two types: those of (*a*) columnar cell origin, including the oat cell, undifferentiated, type and the differentiated adenocarcinoma, and (*b*) those of squamous cell origin. The squamous cell carcinoma represented 50.2 per cent, the oat cell type 24 per cent, adenocarcinoma 9.2 per cent, both squamous cell and adenocarcinoma 0.9 per cent, and the undifferentiated, or anaplastic, type 15.7 per cent. Moersch and Tinney [9] found the squamous cell carcinoma in 52 per cent and the adenocarcinoma in 45 per cent. Horn [17] found that of 45 tumors, 40 per cent were squamous cells, 33 per

17. Horn, H. A.: Carcinoma of Lungs, Bull. Univ. Maryland **30**:169 (April) 1946.

cent were of the small cell type and 27 per cent were adenocarcinomas. Of Brindley's [13] 90 cases, 54 per cent were of squamous cell carcinoma and 46 per cent of adenocarcinoma. Our reports reveal that of the 130 cases in which the biopsy diagnosis of malignancy was obtained, the squamous keratinizing type was present in 118, or 93.8 per cent, adenocarcinoma in 6, or 4.6 per cent, and the anaplastic squamous type in 2, or 1.55 per cent. Craver [18] found that squamous cell and epidermoid carcinoma comprised 54 per cent, adenocarcinoma 14 per cent, anaplastic carcinoma 11 per cent, and carcinoma, questionable type, 21 per cent.

Metastases.—Metastases from the bronchial tumors were as varied as the distribution of the vascular tree. All types of cells produce lymphogenous and hematogenous metastases, according to Arkin,[10] but squamous cell carcinoma is usually less malignant. Muller and

TABLE 4.—*Types of Bronchogenic Carcinoma*

Author	Number of Cases	Squamous Cell Type %	Adeno-carcinoma %	Reserve Cell—Small Oat Cell Types %	Anaplastic Type %	Questionable Origin %
Halpert [8]	135	50.0	20.0	30.0	....	....
Menne and Anderson [2]	56	55.3	23.2	21.4	....	....
Holinger, Hara and Hirsch [6]	151	64.0	10.0	17.0	9.0	....
Björk [7]	234	50.2	9.2	24.0	15.7	....
Moersch and Tinney [9]	363	52.0	45.0	....	3.0	....
Horn [17]	45	40.0	27.0	33.0	....	....
Brindley [13]	90	54.0	46.0	....	....	....
Craver [18]	175	54.0	14.0	....	11.0	21.0
Kulvin	130	93.8	4.6	....	1.5	....

Miller [15] contended that primary carcinoma of the lung is the most widely metastatic. The hematogenous route is shown by the involvement of the brain. The wall of the pulmonary vein is invaded. Ochsner [2] recognized five routes of extension by metastasis: (*a*) direct, (*b*) bronchial or intraluminal, (*c*) implantation by aspiration or operation, (*d*) hematogenous and (*e*) lymphogenous. Only the known and verified lesions, as determined by autopsy, as well as by clinical evidence of metastasis, are tabulated here. Of the 93 cases in which autopsy was performed, involvement of the regional glands was revealed in 51.7 per cent. The adrenal glands, the kidneys and the liver revealed metastases in 33.7 per cent, and the brain, in 16.9 per cent. The bones showed involvement in 28.1 per cent; the heart and pericardium, in 5.6 per cent; the pancreas, in 22 per cent; the lungs, in 20.2 per cent, and the pleura, in 7.8 per cent. In 3 cases autopsy revealed no metastases, and there was no clinical evidence of metastatic carcinoma in

18. Craver, L. F.: Bronchogenic Carcinoma, Am. J. Roentgenol. **43**:469 (April) 1940.

64 cases. If the total number of cases of bronchogenic carcinoma is taken as a basis, the percentage of metastases to the various organs drops considerably, since the matter of diagnosis is conjectural rather than factual and is predicated only on the diagnostic acumen of the examiners. The findings are tabulated for comparison. In 64 cases the clinical diagnosis of bronchogenic carcinoma was made by bronchoscopic biopsy, but no clinical metastases could be recognized. In addition, several investigators, without going into detail as to the number or percentage of cases in which metastasis occurred, found that the regional lymph nodes were involved first, and then, in the order of their incidence, the liver, lungs, bones, kidneys, adrenal glands, pleura, brain, pericardium, pancreas, cervical lymph nodes, heart, thyroid gland and, finally, spleen.

TABLE 5.—*Site of Metastases from Bronchogenic Tumors*

Author	No. of Cases	Regional Lymph Nodes %	Liver %	Kidney %	Adrenal Glands %	Lung %	Bones %	Pancreas %	Heart and Pericardium %	Spleen %	Brain %
Arkin [10]	74	88.0	32.0	43.4	40.0	30.0	28.0	15.0	14.0	8.0	....
Moersch and Tinney [9]	...	79.0	34.0	21.0	36.0	....	52.0	....	19.0	...	19.0
Ochsner, Dixon and DeBakey [3]	3,047	72.0	33.3	17.5	20.3	23.3	21.3	7.3	12.7	3.5	16.5
Horn [17]	45	71.0	38.0	11.0	27.0	....	28.8	13.3	20.0	9.0	33.3
Kulvin	Necropsy 93	51.7	33.7	33.7	33.7	20.2	28.1	2.2	5.6	1.1	7.8
	Clinical 316	18.9	16.7	13.9	13.3	18.9	13.3	0.63	1.89	0.3	2.2

Survival Period.—Survival periods following bronchoscopy are graphically presented in chart 2. The range was from six days to as long as thirty-eight months. Chart 2 reveals that the greatest number of patients died from five weeks to two months after bronchoscopic examination, the average period being four months. Moersch and Tinney [9] found six months to be the average of duration of life after diagnosis. The type of tumor, such as adenocarcinoma or squamous cell carcinoma, regardless of grade, did not influence the duration of life. Holinger [8] found that the time between the appearance of the initial symptoms described by the patient and the bronchoscopic examination was one year for 8 per cent of his patients, six months to one year for 42 per cent and less than six months for 50 per cent. Moersch and Tinney [9] found the time between the onset of symptoms and the bronchoscopic diagnosis of carcinoma to be eight and a half months.

Since this paper is mainly a study of the bronchoscopic findings and confirmation of the pathologic condition by autopsy, if possible,

of the tumors of the bronchi, treatment is not stressed. Of the 130 patients in our series in whom biopsy established the presence of carcinoma, 33 were considered to be living in 1946. Some of these patients found to be living had some form of surgical exploration, such as thoracotomy, lobectomy or pneumonectomy. Four patients had a pneumonectomy performed; 8 patients had roentgen treatment combined with exploratory thoracotomy; 1 received electrocoagulation of the tumor of the bronchus; 1 had excision of a leiomyosarcoma of the bronchus of the upper lobe of the left lung and roentgen ray treatment, and 1 patient had excision of an adenoma of the bronchus. The kind of treatment administered to the others who did not survive was as follows: Two hundred were treated by roentgen radiation of the chest and other areas; 2, lobectomy; 7, pneumonectomy; 2, roentgen radiation and pneumonectomy; 30, roentgen radiation and thoracotomy;

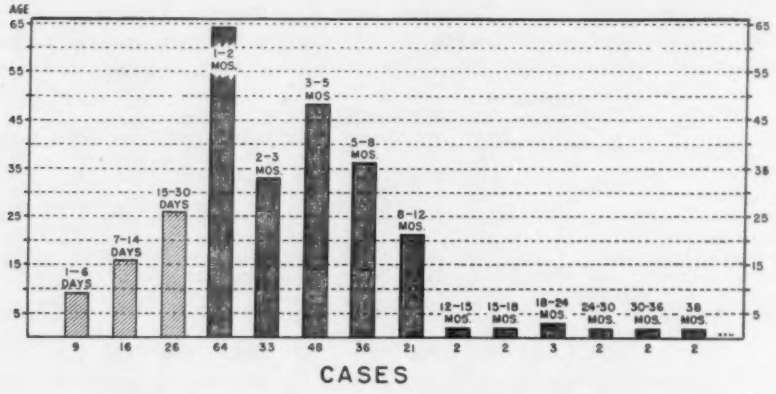

Chart 2.—Period of survival after bronchoscopic diagnosis.

7, exploratory thoracotomy; 5, thoracentesis, and 7, roentgen radiation and thoracentesis.

Björk [7] maintained that about 7.5 per cent of the tumors were operable. Contraindications to operation were as follows: metastases; poor general condition; too close proximity of the growth to the carina; infiltration into the mediastinum, as indicated by widened carina; blood-stained pleural effusion; paralysis of the vocal cord or diaphragm, and the presence of Horner's syndrome. Patients without such contraindications could be surgically treated. Nothing in Björk's review indicated that the differentiation of the carcinoma had any influence on the patient's survival after operation. Of Brindley's [18] patients, pneumonectomy was done on 43 and lobectomy on 2. Seven of these died during the first twenty-four hours after the operation; 7 others died in the hospital after operation; 1 died three months later; 1 had a recurrence in the pleura nine months after operation; 4 are not

accounted for after operation, and the others were alive at the time of the report, from one month to four years after the operation. Ochsner [2] stated that from the statistics presented it can be concluded that roentgen irradiation offers practically no chance of cure and that it should be reserved for patients with inoperable bronchogenic carcinoma or those for whom operation is definitely contraindicated and for whom it is to be used as a palliative procedure. Ochsner [2] stated that surgical extirpation of the lung is the only curative treatment of bronchogenic carcinoma. Resection of a lobe is wholly inadequate. Only by complete excision of the entire lung involved can the primary focus be adequately removed, and only in this way can an adequate extirpation of the regional lymph nodes be accomplished. As the incidence of involvement of regional lymph nodes is high, the nodes should be extirpated, together with the primary tumor. Ariel [19] concluded that the life of the average patient with bronchogenic carcinoma is not prolonged by a course of external radiation therapy.

Dr. Robert Schrek, chief of Tumor Research at Hines Hospital, assisted in preparation of the tables.

Mr. Philip Zinkgraf, of Tumor Research, furnished and explained the master card system from which the data in this paper were compiled.

19. Ariel, I., and others: Use of Large Doses of Interstitial Radon in Inoperable Bronchogenic Carcinoma, to be published.

Progress in Otolaryngology

Summaries of the Bibliographic Material Available in the Field of Otolaryngology

THE PARANASAL SINUSES

SAMUEL SALINGER, M.D.
CHICAGO

(Concluded from Page 462)

SURGICAL TREATMENT

Ottoni de Rezende [84] reviews the various surgical procedures usually employed in the treatment of chronic sinusitis, without offering any critical evaluation except to point out the widespread use of the transantral ethmoid operation described by Ermiro de Lima, which in South America has yielded satisfactory results.

Citelli [85] states that the difficulties attending operation on the frontal sinus, so far as permanent cure is concerned, are inherent in the usual anatomic conformation of the sinus. Radical procedures envision complete removal of all diseased lining and the establishment of an adequate permanent opening into the nasal cavity. This can be done in the maxillary and the sphenoid sinus with comparative ease but presents a problem in the case of the frontal sinus. The author has been successful in achieving a permanent cure through maintenance of an external opening into the sinus near the internal angle to permit ventilation and irrigation for a long enough period until the cavity has healed and the nasofrontal duct is fully established. The surgical technic follows that of Lynch or Killian with modifications. The author seeks to clean out the sinus thoroughly, enlarge the nasofrontal duct and exenterate the anterior ethmoid cells, after which the wound is closed with the exception of the internal end, which is left open for about 2 cm. for the purpose previously mentioned.

Gatewood [86] introduces several modifications of the standard radical operations on the sinuses, which he claims will reduce the trauma to

84. Ottoni de Rezende, M.: Tratamento cirúrgico das sinusites, Rev. brasil. de oto-rino-laring. **14**:337 (July-Aug.) 1946.

85. Citelli, S.: Su un mio metodo semplice che risolve il grave problema della cura chirurgica delle sinusiti frontali purulente chroniche, Oto-rino-laring. ital. **14**:307 (Oct.) 1946.

86. Gatewood, W. L.: Improved Surgical Technique Based on Modifications of Jansen-Ritter (Lynch) and Caldwell-Luc Procedures for Chronic Sinusitis, Arch. Otolaryng. **45**:14 (June) 1947.

healthy tissues while at the same time affording adequate exposure for complete removal of all diseased tissue. He shows in great detail the procedures for blocking the principal nerves supplying the operative field. The incision for the external frontoethmoid operation is made just above the unshaved brow and curves over the nasal bone rather close to the midline, then arches below the orbital margin. The objective is to provide a bony shelf over which the suture line will lie, at some distance from the excavated cavity. The anterior ethmoid artery is ligated, and if it is necessary to enter the sphenoid a circular trephine is used to make an opening just below the natural ostium. Many other refinements of technic are described and adequately illustrated.

Bergara [87] describes his osteoplastic flap operation for exposing and cleaning out large frontal sinuses. The advantages claimed for this procedure are the complete visualization of the sinus cavity, affording access to all its recesses and facilitating the fashioning of a wide passage for permanent drainage into the nose. Cosmetically, also, the operation offers more to the patient than any other procedure.

Thirty-two patients thus treated were cured. In only two instances were there any complications. There was one postoperative hematoma due to displacement of the drain. In the second case an abscess developed nine months after the operation, which was found to be due to an area of denuded bone. The flap was removed and the sinus found almost completely obliterated by fibrous tissue.

To establish a permanently patent nasofrontal passage in cases of chronic occlusion associated with an external fistula, New and Erich [88] have used an acrylic obturator which is worn for six months. The procedure followed is to enlarge the passage through an external approach and insert a rubber tube for one week, or until the inflammatory reaction subsides. At this time a roentgenogram will reveal the size and curve of the tube, which serves as a guide for the construction of a mold from softened dental wax. This is passed into the duct and when found to fit properly is sent to a dental laboratory to serve as a model for the acrylic obturator. This is then substituted for the rubber tubes and may be removed for cleansing at intervals. After six months the duct will remain open without an obturator, and the external fistula may be closed by a plastic operation.

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87. Bergara, R.: Osteoplastic Operation on the Large Frontal Sinus in Chronic Suppurative Sinusitis: End Results, Tr. Am. Acad. Ophth. **51**:643 (July-Aug.) 1947.

88. New, G. B., and Erich, J. B.: An Acrylic Obturator Employed in the Repair of an Obstructed Frontonasal Duct, Arch. Otolaryng. **45**:209 (Feb.) 1947.

Goodyear [89] outlines the surgical procedures on the frontal sinus which he has found most successful. He is in favor of early trephinement of the sinus in severe acute cases, especially after swimming, when there is early edema, severe pain, headache and fever. He uses a hand nail drill for this purpose, penetrating the floor of the sinus without stripping the periosteum. The mucosa is not disturbed, and a small drain is sufficient to keep the wound open.

In most chronic cases he advises an intranasal approach. The septum is straightened if necessary, the middle turbinate bone split and its external half removed. The anterior ethmoid cells are opened with a Myles nasal punch forceps sufficiently to admit a Pratt curet. At times a pointed curved rasp is used to locate the frontal ostium. The external approach is sometimes necessary. A modifled Jansen-Lynch procedure is used and the duct kept open by using Ingals' gold tube which can safely be left in place for months. In cases in which obliteration is indicated, the author preserves the supraorbital ridge and after exenterating the sinus, including the entire anterior wall, forces the skin against the denuded posterior wall of the sinus. A tight pack left in place for two weeks ensures a firm adhesion.

Solero [90] describes Uffenorde's operation for chronic sinusitis, which he has successfully employed in 5 cases. The incision is the usual curvilinear one extending along the side of the nose, from the pyriform margin to the internal two thirds of the supraorbital margin, exposing the floor of the frontal sinus, the lacrimal bone, the nasal bone and the ascending process of the superior maxilla. The lacrimal bone is removed, as is the ascending maxillary process, the nasal bone and the internal third of the sinus floor. The internal nasal spine and the nasal process of the frontal bone are removed. The anterior wall of the sinus is spared. Other items considered important are the removal of the intersinus septum, freeing the middle turbinate bone from its attachment to the frontal process of the maxilla, not disturbing the mucosa of the lateral wall of the nose and thorough cleaning out of the ethmoid sinuses and the frontal sinus mucosa. A mucous membrane flap is formed from the lining of the lateral nasal wall. Gauze packing is used.

The author claims that this operation is particularly adapted to small and medium-sized frontal sinuses.

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89. Goodyear, H. M.: Surgery of the Frontal Sinus, Laryngoscope **57**:340 (May) 1947.

90. Solero, C.: Considerazioni sull'intervento radicale del seno frontale in rapporto al metodo di Uffenorde, Minerva chir. **2**:145 (April) 1947.

Negus [91] does not approve of attempts to obliterate the frontal sinus, having observed a number of cases in which reinfection necessitated further operation. In fact, he has in several cases reestablished the lumen of the cavity by implantation of skin graft. Success, in his opinion, hinges on the use of great care in the removal of diseased tissue from the sinus, avoiding too extensive exenteration of mucosa and leaving the posterior wall alone unless there are signs of intracranial involvement. He favors adequate exposure by removal of the ascending process of the superior maxilla in order to reach the anterior ethmoid cells. Maintenance of an adequate nasofrontal duct is ensured by the use of a skin graft covering the exposed bone, held in place for ten days by a rubber tube. He emphasizes the importance of diagnosing chronic frontal sinusitis and instituting surgical treatment which, as described, has in his hands yielded a high percentage of recoveries in more than 100 cases. Unilateral morning headache recurring over a period of time and clinical and roentgenologic evidence after proper examination of the maxillary sinus are factors indicating infection of the frontal sinus. However, it is important in all cases, before an operation on the frontal sinus is decided on, that a high deviation of the septum be corrected and a blocking middle turbinate bone resected.

Castro O'Connor [92] reports successful repair of a frontoglabellar defect due to war injury by means of cancellous iliac bone chips according to a procedure described by Mowlem. The iliac crest was excised and a mass measuring 8 by 2 cm. obtained. The cortex was discarded and the cancellous portion divided into twelve to fifteen squares more or less uniform, which were molded into the prepared defect. A moderate pressure dressing was applied for six days and primary union obtained. Later it was necessary to plane off one or two sharply projecting ridges, but the over-all cosmetic result was good.

SINUSES, NASAL NONSURGICAL THERAPY OF SINUSITIS

General.—Cracovaner and Daly [93] summarize the therapeutic measures followed in an air force hospital for sinusitis as follows:

In acute cases shrinking agents, irrigations, spot suction and adequate chemotherapy were given. In cases of acute frontal sinusitis, if this failed to give relief, the middle turbinal bone was infracted. In some cases a trephine opening was made in the floor of the sinus,

91. Negus, V. E.: The Surgical Treatment of Chronic Frontal Sinusitis, Brit. M. J. **1**:135 (Jan. 25) 1947.

92. Castro O'Connor, R.: Reparación de un hundimiento del hueso frontal mediante el injerto oseo de Mowlem, Semana méd. **1**:151 (Feb. 6) 1947.

93. Cracovaner, A. J., and Daly, J. F.: Sinusitis: The Treatment Practiced in an Air Force Hospital, Arch. Otolaryng. **45**:283 (March) 1947.

followed by local instillations of penicillin or tyrothricin. The antrum was not irrigated in acute cases until after one week of conservative treatment. The authors found no advantage in the use of antibiotics locally instead of isotonic sodium chloride solution.

In cases of acute ethmoid and sphenoid sinusitis shrinking agents and chemotherapy were relied on. They did not find displacement therapy with or without antibiotics to be of any particular value.

In chronic maxillary sinusitis, if several irrigations failed to resolve the infection, an antrostomy was performed, frequently with a submucous resection if the latter was indicated. Bacteriologic reports are followed as a basis for the selection of an antibiotic which is employed postoperatively. The Caldwell-Luc operation was done only in a few cases in which the examination revealed a far advanced degeneration of the mucosa with polypoid degeneration.

Chronic ethmoiditis was usually found in association with a chronic maxillary sinusitis and was treated by intranasal exenteration, as much of the middle turbinate bone as possible being spared and a deviated septum resected at the same time if indicated. The external operation was reserved only for cases with osteitis or orbital complications. In all instances, postoperative discharge was treated by the administration of antibiotics and the injection of autogenous vaccines.

Chronic frontal sinusitis was treated by removal of the anterior end of the middle turbinate bone, removal of polypi and such other local procedures as would improve drainage. The external operation was performed only in cases of osteomyelitis or other complications.

The authors emphasize the value of autogenous vaccines in all chronic cases with recurring acute episodes.

Ruskin[94] contends that determinations of the *p*H of intranasal solutions must be considered in conjunction with the electrolyte content of the solution and other factors affecting the permeability of membranes. Citing a number of investigators, he points out that permeability of membranes depends on the status of the intercellular cementum and that this cementum is best maintained in its normal state through the influence of calcium and ascorbic acid. Accordingly the use of calcium sulfathiazole in the nose in a series of several hundred patients was found to be considerably less irritating than the sodium salt. Since this solution has a *p*H of 7.8 to 8, it appears to the author that Fabricant's dictum concerning the desirability of having nasal solutions on the acid side is untenable in the light of the influence of electrolytes on the intercellular substance and his own experience with the solutions mentioned.

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94. Ruskin, S. L.: Interrelationship of Hydrogen Ion Concentration, Electrolyte Contents and Colloids in Permeability of Membranes, Arch. Otolaryng. **45**: 398 (April) 1947.

Woodward [95] states that antrum lavage followed by penicillin instillation was successful in 80 cases of acute maxillary sinusitis after an average of 2.7 irrigations, and he recommends it for all patients from the age of 6 upward. Patients who resist this therapy should be examined for gram-negative organisms, and if these are found the use of streptomycin should be of value. Also, the teeth should be examined for possible foci. In chronic cases roentgenograms with the use of iodized poppyseed oil (40 per cent) should be made to determine the status of the mucosa, and if sufficient evidence is present the diseased mucosa should be removed by means of a Caldwell-Luc operation.

In acute frontal sinusitis the use of local heat, vasoconstrictors and infraction of the middle turbinate bone usually is followed by relief. Cases in which the condition persists or becomes chronic may require an external operation.

Ethmoid or sphenoid sinusitis rarely requires an operation in the acute stages, since adequate drainage of the antrum is usually followed by recession of the process in the other sinuses. Only in case of orbital or intracranial complications is surgical intervention indicated. In chronic cases resection of the septum and infraction of the turbinal bone facilitate drainage and ventilation.

Van Alyea [96] sounds a conservative note in a discussion of the treatment of acute rhinosinusitis, laying emphasis on simple measures that assist the natural resistive forces without burdening the tissues with irritants. He decries the local use of sulfonamide compounds and penicillin in acute cases, relying only on ephedrine in a low p_H solution. Dowling packs are irritating in all but the subacute stages, and better results can be obtained with a 1 per cent cocaine solution and an infra-red lamp. Short wave treatments and roentgen rays have only a slightly palliative effect. Infra-red rays, injection of foreign protein and large doses of vitamin C have some beneficial effects. In the subacute stages, infraction of the turbinal bone and irrigations are of definite value.

Emergency openings in the maxillary and frontal sinuses are of definite value when the symptoms point to possible impending complications.

Lederer [97] insists on a complete inventory of the patient's general status in all cases of sinusitis and lists the items coming under this head. Proceeding then to the examination of the ear, nose and throat,

95. Woodward, F. D.: The Diagnosis and Treatment of Acute and Chronic Sinusitis, M. Rec. & Ann. **41**:139 (April) 1947.

96. Van Alyea, O. E.: Treatment of Acute Nasal and Sinus Infection, North Carolina M. J. **8**:63 (Feb.) 1947.

97. Lederer, F. L.: Modern Therapy of Sinus Disease, J. Oklahoma M. A. **40**:366 (Sept.) 1947.

he again graphically points out the details making for completeness. Similarly, he presents charts showing the analysis of headaches and the modes of spread of sinus disease to adjacent structures. All of this, in his opinion, is necesary if one is to get at all the contributing factors that make for persistence of symptoms.

Discussing therapy, he stresses the importance of medicaments having the proper p_H (6.5 or less), the influence of allergy and metabolic and endocrine disorders. He credits surgical diathermy with improved results in the treatment of malignant processes of the sinuses and antibiotics with the prevention of serious complications.

SINUSES, NASAL DRUGS IN TREATMENT OF SINUSITIS

Lindsay [98] states that his experience with the sulfonamide compounds and tyrothricin employed locally in acute infections of the upper respiratory tract has been generally unsatisfactory. Neither are they of much help in cases of chronic infections of the sinus. Some beneficial results have been noted when these drugs were used in the postoperative period. Penicillin also has been of limited value. Patients whose infections are not severe enough to require hospitalization may be benefited when the drug is given by mouth or in daily injections of large amounts in beeswax and peanut oil. Serious infections naturally require higher concentrations, which can be obtained only through parenteral administration.

Ryan [99] studied the effects of certain vasoconstrictors on the mucous membrane of rabbits by histologic sections of mucosa removed at intervals over a period of from three to forty days. Two series of animals were used for two types of commercial nose drops. "Preparation 1" contained 0.125 per cent of d-desoxyephedrine hydrochloride in a stabilized aqueous solution, 1.25 per cent of anhydrous sodium sulfathiazole and 1.25 per cent of sodium sulfadiazine. "Preparation 2" was a solution of 2-naphthylmethylimidazoline hydrochloride. This preparation seemed to produce a greater postcongestion reaction and is one that is popular. Both solutions contained buffers and were of a low p_H (6.2 per cent).

Successive studies of excised mucosa revealed early destruction of the cilia, accompanied with transformation into stratified squamous epithelium. "The subepithelial layer was edematous; it became denser and thicker than normal, underwent fibrosis. The blood vessels became

98. Lindsay, J. R.: Chemotherapy in Infections of the Ears and Paranasal Sinuses, Bull. Vancouver M. A. **23**:35 (Nov.) 1946.

99. Ryan, R. E.: The Histologic Effect of Repeated Application of Certain Nose Drops to the Nasal Mucous Membrane of Rabbits, Ann. Otol., Rhin. & Laryng. **56**:46 (March) 1947.

dilated and remained dilated for several weeks." Later constriction and sclerosis were noted. Exudate and other inflammatory signs were also seen.

Since the mucosa of rabbits is similar to that of human beings, the author concludes that overuse of vasoconstrictors is harmful. The drops were instilled four times daily.

Dunn [100] presents an analysis of results obtained with penicillin in the treatment of 79 patients with sinusitis. Various methods of administration were employed, such as displacement, nose drops, direct instillation and intramuscular injections. Several typical cases are cited, with accompanying roentgenograms. He concludes that while a majority of the patients claimed relief, many of these would have responded to ordinary conservative therapy. In 3 patients whose antral washes yielded a penicillin-sensitive organism, it was noted that after prolonged penicillin treatment the cultures showed Bacillus pyocyaneus. In several patients local rash developed in the vicinity of the vestibule.

In general, the author feels that the use of penicillin, while helpful, cannot permanently cure patients with more or less chronic infections causing gross changes in the mucosa. Neither is it effective in cases of oroantral fistula, foreign body or conditions favoring stasis. In all cases in which penicillin is employed it is important that the diagnosis and progress be confirmed by roentgenograms.

Davison [101] emphasizes the importance of testing the offending organisms for sensitivity to penicillin. In a series of 50 cases he found that 88 per cent of the patients having bacteria sensitive to 0.2 units per cubic centimeter in the culture mediums recovered, whereas only 10 per cent recovered when the bacteria were found to be resistant to this concentration. The penicillin was given intramuscularly in 50,000 unit doses every three hours. In addition, irrigations were employed.

Canaveris [102] discusses the administration of sulfonamide drugs and penicillin from the point of view of their deleterious action and reactions. He points out the necessity for selecting a drug more potent for the type of bacteria present and the importance of adopting measures whereby administration of the drug may be continued despite unfavorable reactions. He insists on rest in bed and avoidance of sunlight and claims that the administration of liver extracts frequently accomplishes the purpose. One of the difficulties imposed by the administration of

100. Dunn, R. E.: Penicillin in the Treatment of Infections in the Nasal Passages and Sinuses, Australian & New Zealand J. Surg. **16**:163 (Jan.) 1947.

101. Davison, T. W.: The Penicillin Treatment of Sinus Infection, Pennsylvania M. J. **51**:272 (Dec.) 1947.

102. Canaveris, R. G.: Sulfamidas y penicilina en otorrinolaringologia, Dia méd. **19**:12 (Jan. 6) 1946.

these drugs is the masking effect which often obscures the picture, so that frequently the most opportune time for surgical treatment may be passed by.

In all the cases which he cites otitic infection was present.

Tamesis [103] used penicillin (10,000 units per cubic centimeter) by instillation in 15 cases of chronic maxillary sinusitis and claims that 73 per cent of the patients completely recovered as evidenced by cessation of discharge and relief of subjective symptoms. However, 36 per cent of the patients had a recurrence of the symptoms during the following six months or more. (Since no bacteriologic or roentgenologic studies were made and no controls used, it would seem that the value of penicillin in these ill defined cases is more or less doubtful.—S.S.)

Fox [104] reports his experience with sulfamylon® (4-amino-2-methyl benzene sulfonamide hydrochloride) in 137 patients. A 1 per cent solution in combination with 0.25 per cent phenylephrine hydrochloride (neosynephrine hydrochloride®) was employed. This solution has a p_H of 5.5 and in experiments in rabbits was found to be less irritating than the other sulfonamide compounds. Its superiority is attested by its effectiveness against anaerobes as well as aerobes. Cultures taken in half the patients treated revealed Streptococcus viridans, Staphylococcus aureus, Staphylococcus albus, Bacillus proteus, Pseudomonas aeruginosa and Diplococcus pneumoniae. In early acute rhinosinusitis without involvement of the antrum the solution was used as a spray every two to four hours (drops for children). For empyema of the antrum the solution was instilled after irrigation with isotonic sodium chloride solution and also employed at home with the atomizer. No reactions were noted. The improvement in the cases of involvement of the antrum was prompt, seldom requiring more than three irrigations. Eleven cases of empyema of the antrum that failed to yield to penicillin irrigations and sulfathiazole orally responded promptly to the sulfamylon® therapy.

Ruedi [105] states that in purely bacterial infections of the sinuses good results may be expected from the intramuscular injection of penicillin in 100,000 unit doses up to a maximum of 1,000,000 units each day. Also, he advises daily instillation of 2,000 to 4,000 units into the affected sinus. The use of penicillin after radical operation on the sinus is not only beneficial in preventing infection but seems to be effective in preventing the recurrence of polypi.

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103. Tamesis, J.: Local Instillation of Penicillin in Chronic Suppurative Maxillary Sinusitis, J. Philippine M. A. **22**:425 (Oct.) 1946.

104. Fox, S. L.: The Use of Sulfamylon in Rhinosinusitis, Ann. Otol., Rhin. & Laryng. **56**:946 (Dec.) 1947.

105. Ruedi, L.: Nasennebenhöhlenentzündungen und Penicillinbehandlung, Praxis **35**:867 (Dec. 12) 1946.

Schenck,[106] while conceding that antibiotics have reduced the incidence and extent of operations on the sinuses, nevertheless makes it clear that these drugs are no substitute for surgical intervention in the presence of pus or sequestrums. He also finds that chronic sinusitis is less responsive to antibiotics. Tyrothricin fails to penetrate the tissues deeply enough, and administration of penicillin and streptomycin, though effecting temporary improvement, is frequently followed by recurrences when the drug is withdrawn. However, these are extremely useful as an adjunct to surgical intervention. There is no question of their value in the presence of serious complications.

Conley[107] employed a plastic tubing made of a polymer of ethylene, small enough in diameter to be threaded through a Coakley trocar, to facilitate frequent irrigation of the antrum with a penicillin solution in a number of chronic cases, with good results. The tubing can be left in situ for several days without discomfort and affords a means of introducing the solution several times a day. In addition, the patient is given penicillin intramuscularly and sulfadiazine by mouth. The author points out, however, that the therapy is not a panacea, since it is necessary to treat adequately contributing factors, such as allergy or deviations of the septum.

Scott-Moncrieff[108] reviews briefly the various methods of administering penicillin for disease of the sinus and states that the best results are obtained in cases in which the infection has gone beyond the confines of the sinus, as in cases of orbital complications and of fracture. He cannot see how the drug can penetrate the edematous avascular or fibrotic tissues to do much good in instances of ordinary chronic sinusitis. The same applies to the intermittent local application in the form of an instillation. Here also the contact is too superficial and too brief to be of much benefit. As with other commentators, stress is laid on the importance of adequate drainage.

Fabricant, Hollender and Anderson[109] employed solutions of sodium penicillin and calcium penicillin in varying concentrations on the nasal mucous membrane of rabbits to determine whether any deleterious effects might result. The animals were killed after thirty, sixty and ninety days and the mucosa sectioned. It was found that concen-

106. Schenck, H. P.: Antibiotics in the Treatment of Sinus Infections, Ann. Otol., Rhin. & Laryng. **56**:39 (March) 1947.

107. Conley, J. J.: The Use of Plastic Tubing in the Treatment of Chronic Maxillary Sinusitis, Ann. Otol., Rhin. & Laryng. **56**:678 (Sept.) 1947.

108. Scott-Moncrieff, R.: Penicillin in Treatment of Sinusitis, Canad. M. A. J. **56**:296 (March) 1947.

109. Fabricant, N. H.; Hollender, A. R., and Anderson, H. W.: Effect of Various Solutions of Penicillin Sodium and Penicillin Calcium on the Respiratory Nasal Mucosa of Rabbits, Arch. Otolaryng. **46**:36 (July) 1947.

trations of from 1,000 to 5,000 units per cubic centimeter employed daily for the periods mentioned caused no damage. The authors believe that the low p_H of the solutions may have had something to do with the absence of irritation. It is interesting to note, however, that the sections showed hyperemia, some round cell infiltration and a moderate increase in the goblet cells.

McAuliffe and Mueller [110] describe a simple suction and pressure apparatus with which it is possible to introduce penicillin aerosol into the sinuses through alternating suction and pressure. The apparatus is simple, easily controlled and portable. They found that the procedure was safe and effective.

Davis [111] used calcium penicillin aerosol and streptomycin, 100,000 units each, in 1 to 2 cc. of propylene glycol in several cases of chronic cough due to tracheobronchitis, sinusitis and other infections of the respiratory tract and reports decided alleviation of the symptoms. Treatments were given in the office by a trained nurse. The author states that one must not rely entirely on this medication to the exclusion of other necessary measures such as irrigations of the sinus and other indicated procedures.

Ballenger [112] reports on his results in a series of 1,500 persons suffering from acute infection of the respiratory tract who were treated by the blowing or insufflation of a powdered sulfonamide compound. After preliminary shrinking of the nasal mucosa, the powder was blown in with a standard DeVilbiss powder blower, covering all the visible mucosa of the nose, nasopharynx and pharynx with a thin film. Clinically, it was observed that when the powder was employed early the infection subsided more promptly than in similar cases in which it was not used. The percentage of complications such as sinusitis and otitis was less. The incidence of sensitivity was less than 0.5 per cent.

Boyd [113] used penicillin in 22 cases of chronic sinusitis at an army hospital and reports clinical cures in all but 3 in a check-up after a month's furlough. Treatment consisted of sinus wash followed by instillation of penicillin, 250 units per cubic centimeter, and intramuscular injections of 20,000 units every three hours for periods

110. McAuliffe, G. W., and Mueller, G. C.: Aerosol Penicillin Administered in Paranasal Sinusitis with Balanced Suction and Pressure, Arch. Otolaryng. **46**:67 (July) 1947.

111. Davis, D.: Inhalation of Penicillin Aerosol and Penicillin-Streptomycin in Office Practice, Arch. Otolaryng. **46**:307 (Sept.) 1947.

112. Ballenger, H. C.: Sensitivity from Insufflation of the Powdered Sulfonamide Compounds in Acute Infections of the Nose and Throat, Arch. Otolaryng. **46**:52 (July) 1947.

113. Boyd, H.: Penicillin Therapy in Chronic Suppurative Sinusitis: A Report of Twenty-Two Cases, Laryngoscope **57**:460 (July) 1947.

up to ten days or more. In all cases cultures were made and roentgenograms taken before and after. It is interesting to note that the "after" roentgenograms were labeled "marked improvement" in 7, "moderate improvement" in 8, "slight improvement" in 5 and "none" in 2. Most of the sinuses were clear on transillumination, and discharge and other symptoms had cleared up except in a few cases in which allergy was a factor. Minor operations to improve drainage were performed in several cases. The author believes that the use of penicillin has a definite place in the therapy of chronic sinusitis but is not to be considered a replacement for surgical intervention when this is indicated.

Barach, Rumsey, Sorka and Rader [114] describe a new simplified method of producing negative pressure during nasal inhalation of penicillin aerosol. An automobile foot pump operated by the patient supplies the compressed air, thus eliminating the necessity for an oxygen tank. It is connnected up to the nebulizer and a rebreather bag which permits reinhalation of the aerosol not absorbed during the first inhalation. A metal Venturi tube® connected with the nebulizer and controlled by the patient's finger supplies the negative pressure for evacuating air from the sinuses. Effective blood penicillin levels have been demonstrated after inhalation of 50,000 units per cubic centimeter of isotonic sodium chloride solution.

Rasmussen [115] finds that Burhøj exaggerates the dangers in endonasal operations, the complications described being infrequent and seen in cases of both acute and chronic sinusitis, that he does not mention the Proetz treatment, which is considerably more lenient than the usual treatment and that the effect of the chemotherapeutic treatment does not seem convincing, as local treatment was also given as well as the oral treatment of acute pansinusitis with different chemotherapeutic agents. Except for the few cases in which a highly febrile condition develops which can presumably be affected by chemotherpeutic measures, it is doubtful whether the administration of chemotherapeutic agents influences the course of sinusitis. Control material is lacking and might have been obtained by subjecting only every other patient to chemotherapy.

Burhøj answers that complications in endonasal operations, though rare, should be mentioned, for they occur and undoubtedly far from all

114. Barach, A. L.; Rumsey, C. C.; Sorka, M., and Rader, D.: A Simplified Technic of Treating Sinusitis with Penicillin Aerosol, New York State J. Med. **47**:1498 (July 1) 1947.

115. Rasmussen, H.: Chemotherapeutic Treatment of Acute Suppurative Pansinusitis, Nord. med. (Hospitalstid.) **27**:1968 (Sept. 28) 1945 [comment on Burhøj's article]. Burhøj, E.: Sulfonamides in Chemotherapy of Acute Suppurative Pansinusitis, Nord. med. (Hospitalstid.) **27**:1485 (July 27) 1945.

have been published. Control material as suggested cannot be obtained successfully in a small group, since different factors such as the virulence of the bacteria and the general condition play a part. In his opinion chemotherapy shortens the course of pansinusitis. It does not exclude local treatment. No complications occurred during the chemotherapeutic treatment. With the treatment previously applied there were from time to time grave complications of long standing, requiring surgical treatment which it now seems possible to avoid. He therefore advocates chemotherapy in cases of acute pansinusitis, especially since the constant care of the hospitalized patients reduces the danger in the treatment to a minimum and they are saved a lengthy convalescence. Pansinusitis is in most cases grave and often incapacitates for a long time.

Richtnér's [116] monograph, which was published in 1943 and reached us some four years later, is somewhat out of date, considering subsequent investigations on the same subject. Nevertheless, it reveals a painstaking laborious investigation of the effects of the local use of sulfathiazole on the mucous membrane. The work comprises determinations of sulfathiazole concentrations in the tissues and blood of experimental animals, observations of the effects on ciliary activity and clinical results in a number of patients.

Briefly, the results were as follows: Concentration of sulfathiazole in the mucous membrane of rabbits attained levels approximating those of the blood after two days of treatment.

Employing the freezing-drying method of tissue study, the author was able to show that sulfathiazole solutions applied topically had within three hours penetrated into the submucous layers and that, after suspension of therapy, the sulfathiazole disappears from the tissues within twenty-four hours.

As for the effects on the ciliary activity, the author reports some rather incongruous results. He says that "sulfathiazole in pure substance is indifferent towards the nasal mucous membrane of rabbits while the drug in suspension form brings about a certain, if slight, irritation. A 20 per cent sulfathiazole solution appears, on the other hand, to have an injurious effect on the mucous membrane of the rabbit." Further, a 1 per cent solution retarded ciliary activity, but sulfathiazole in sterile pure substance and in suspension did not seem to affect it. He states that "concentrations of total sulfathiazole in the nasal and sinal mucous membrane from 1.5 to 45 mg. per cent do not injure the ciliary activity."

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116. Richtnér, N. G.: On the Problem of Intranasal Medication: Experimental and Clinical Chemotherapeutic Study, Acta oto-laryng., 1943, supp. 49, p. 1.

Clinically, the author found that the local use of sulfathiazole in acute rhinitis shortened the duration of the infection and prevented the development of secondary bacterial involvement.

Darling and Baumeister,[117] on the basis of observations in a series of 250 persons with head colds who were treated with nose drops of tyrothricin in combination with a vasoconstrictor, found an appreciable diminution of toxicity, duration and complications as compared with a control series of 110 patients treated only with nose drops. The difference was most notable in cases occurring during spring and fall and less pronounced in the group treated during winter.

Pasteurellosis is common in animals but rare in human beings. Bartley and Hunter[118] cite a case of a farmer of 27 in whom the infection was located in the frontal and ethmoid sinuses. Despite the administration of penicillin intramuscularly and through a frontal catheter, there was no improvement. An external operation was performed, which revealed a bilocular frontal sinus with the orbital extension draining poorly through a small opening. A catheter was left in the sinus, through which penicillin was instilled daily until the patient recovered. Bacteriologically, the cultures showed a typical Pasteurella septica. The details of the serologic studies and animal inoculations are fully described.

Hymes[119] used 4 to 6 cc. of a solution of penicillin, 2,000 units per cubic centimeter, by displacement with the head extended in cases of acute and subacute sinusitis. The negative pressure is produced by the patient himself closing off the nares with thumb and forefinger while trying to inhale six times. Excellent results are reported in 28 of 30 cases. Some burning was complained of but was not too serious.

Kahn[120] reports 7 cases of frontal sinusitis in which penicillin was of distinct value in promoting a cure. In most of the cases a penicillin-sensitive organism was found on culture. The series comprises mostly suppurative cases of greater or lesser duration, in most of which it was necessary to resort to surgical treatment. The author feels that his good results were in great measure due to the use of penicillin locally as well as intramuscularly.

117. Darling, D., and Baumeister, C. F.: Tyrothricin in the Treatment of the Common Cold, Arch. Otolaryng. **46**:395 (Sept.) 1947.

118. Bartley, E. O., and Hunter, K.: Penicillin in Surgical Treatment of Pasteurella Sinusitis, Lancet **252**:908 (June 28) 1947.

119. Hymes, C.: Displacement of Penicillin Solution from Nasal Chambers into Paranasal Sinuses by Means of Self-Induced Intranasal Negative Pressure, Tr. Am. Acad. Ophth. (1946) **51**:173 (Jan.-Feb.) 1947.

120. Kahn, K. M.: Role of Penicillin in the Management of Acute and Chronic Frontal Sinusitis, Arch. Otolaryng. **46**:393 (Sept.) 1947.

Persky[121] used par-pen® nose drops (solution of paredrine hydrobromide® and penicillin) in 60 patients with acute infection of the upper respiratory tract and found that 35 of 48 patients followed up were cured and 11 appreciably improved. The drug was well tolerated in all but 3 cases.

Mertins[122] reports 3 cases in which excessive use of naphazoline hydrochloride (privine hydrochloride®) resulted in pronounced nervous disorders with loss of weight. Locally, the mucosa presented a dull gray color, and the turbinate bones were markedly swollen and resistent to other shrinking agents. Treatment of this condition consisted in withdrawal of the drug, steam inhalations and sedatives. Antihistamine drugs were not found to be of much benefit.

Most cases of sinusitis, Romberg[123] states, occur in connection with infectious diseases; some are due to dental disease and some to secondarily infected hematoma in injuries to the jaw and in malignant tumor. Neuralgiform pain, transient and capricious and responding to the usual antineuralgic remedies, is more common than constant pain, which is always localized over the affected sinus, in the early stage infrequent and a sign of violent infection and in a later stage a sign of aggravation with stagnation of secretion. Unilateral secretion from the nose in adults suggests sinusitis. In cases in which there are symptoms of complication, roentgen diagnosis is indispensable. Treatment in the initial stage of acute sinusitis is conservative. After the initial stage of acute maxillary sinusitis the treatment is irrigation. If it proves ineffective, the patient should be referred to a specialist for endonasal trepanation; if recovery does not follow, radical operation (Luc-Caldwell or Dencker) in indicated. When fetid discharge from the maxillary sinus continues after one or two irrigations, dental empyema should be suspected. For puncture of the maxillary sinus, Krause's trocar is preferred to the Lichtwiz needle. Treatment should be continued until the irrigation fluid is free from secretion. Chronic sinusitis, in addition to local symptoms, may cause disturbances of more general kind. In cases of frontal sinusitis only conservative treatment, mainly agents to reduce the swelling, should be applied. In these cases there is a greater tendency to disease of the bone which may lead to complications dangerous to life. With symptoms of retention and pressure and tenderness over the frontal sinus, the patient should be hospitalized. Usually a few days after simple trepanation

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121. Persky, A. H.: Paredrine-Penicillin in the Treatment of Rhinitis and Sinusitis, Eye, Ear, Nose & Throat Monthly **26**:322 (June) 1947.

122. Mertins, P. S., Jr.: Excessive Self Medication with Naphazoline Hydrochloride ("Privine Hydrochloride"), J. A. M. A. **134**:1175 (Aug. 2) 1947.

123. Romberg, G. J.: Acute Sinusitis, Nord. med. **14**:1307 (May 2) 1942.

irrigation treatment may be given by way of the trepanation opening. Acute ethmoiditis is treated along the same lines as frontal sinusitis. Sphenoiditis should receive the attention of the specialist; irrigation treatment of a sphenoid sinus is technically difficult and the course of healing hard to follow. There is considerable danger of chronic sphenoiditis.

Latraverse [124] reports 2 cases of acute sinusitis and bronchitis due to grip which yielded dramatically to penicillin aerosol. There was nothing spectacular about the cases except that in the first one, in which a bronchiectasis was suspected, a bronchographic study with iodized poppyseed oil 40 per cent produced an intense allergic reaction.

Miscellaneous.—Burtoff's study [125] was carried out for the purpose of evaluating the merits of various antibiotics employed locally by irrigation in a series of 100 patients. Diagnosis of infection of the antrum was made by the usually accepted procedures, and the progress of the case was checked by means of subsequent roentgenograms, bacteriologic examination of expelled fluids and the use of contrast mediums. The solutions employed were isotonic sodium chloride solution, 5 per cent sulfathiazole in iodized oil, 5 per cent sodium sulfathiazole in sodium chloride solution and penicillin in sodium chloride solution in strengths of 250, 500 and 1,000 units per cubic centimeter. After the first irrigation with isotonic sodium chloride solution, one of the other solutions was used, and if the patient failed to show definite improvement, another was tried. Since the 100 patients were divided into groups of 25, various rotations of the successive solutions were achieved, the trial periods at different stages thus being equalized. It was evident from a careful study of these cases that the simple isotonic sodium chloride solution was just as effective in bringing about resolution as any of the antibiotics employed in the same manner. In the acute and subacute cases the patients improved after two or four treatments with any of the four solutions. Those with chronic allergic conditions failed to respond to any of the solutions. Chronic infections seemed to improve more rapidly after the use of the 5 per cent sodium sulfathiazole in sodium chloride solution than after the use of 5 per cent sulfathiazole in iodized oil. The penicillin solution was no more effective than isotonic sodium chloride solution. Penicillin was effective in reducing the incidence of susceptible organisms after three of four

124. Latraverse, V.: La pénicilline par voie nasale bronchite et sinusite grippales, Union méd. du Canada **76**:822 (July) 1947.

125. Burtoff, S.: Evaluation of Diagnostic Methods Used in Cases of Maxillary Sinusitis, with a Comparative Study of Recent Therapeutic Agents Employed Locally, Arch. Otolaryng. **45**:516 (May) 1947.

irrigations, but in chronic cases the purulent condition persisted. The results, on the whole, were not what might have been expected.

Lemon [126] reports good results in the treatment of acute maxillary sinusitis in a series of 566 consecutive cases among military personnel. He used isotonic sodium chloride solution by puncture through the inferior meatus. Patients having a foul or a grayish green discharge which failed to clear up after eight to twelve irrigations were operated on.

Forman [127] suggests a method of instilling penicillin solutions into the antrum frequently without discomfort to the patient. It consists of passing a no. 4 ureteral catheter through the puncture needle and leaving it in situ after withdrawing the needle.

Bob, Baritiu and Bogdan [128] brought about striking relief from severe neuralgia in a case of a malignant process of the maxillary sinus that had been operated on. They suggest pointing the needle toward the superior portion of the pterygomaxillary fossa, where the chances of striking the nerve close to the foramen rotundum are more likely.

Popa [129] employed acetylsalicylic acid in the treatment of patients with chronic maxillary sinusitis and claims to have cured all but 2, who later required surgical intervention. The indication for the therapy is maxillary sinusitis which has resisted treatment for as long as six weeks or in which the discharge is persistent or fetid. The acid is insufflated in powder form through the cannula after preliminary irrigation. In successful cases this is followed by temporary increase in the discharge, which becomes more mucoid. The patient experiences a sensation of heat in the cheek for a short while. In some cases vertigo and labyrinthine disturbance were noted. The author claims that in cases in which the insufflation is not followed by increased mucous discharge one may assume that surgical treatment will be required.

Furstenberg [130] discusses the "sinus conscious" laity who erroneously attribute all sorts of symptoms about the head to infection of these cavities. He explains why headache is rarely an indication of chronic sinus disease and decries the overemphasis on the part of many patients

126. Lemon, A. N.: Acute Maxillary Sinusitis, M. Rec. **160**:229 (April) 1947.

127. Forman, F. S.: A Procedure for Instilling Penicillin into the Antrum, Arch. Otolaryng. **45**:593 (May) 1947.

128. Bob, G.; Baritiu, G., and Bogdan, E.: Les injections d'alcool dans la névralgie faciale provoquée par les tumeurs des sinus, Rev. sc. oto-rhino-laryng. **10**:127 (July-Oct.) 1946.

129. Popa, N.: L'acide acéthyl-salicylique dans le traitement local des sinusites maxillaires, Bull. Acad. méd. Roumanie **11**:59, 1946.

130. Furstenberg, A. C.: So You Think It's Sinusitis, Hygeia **25**:758 (Oct.) 1947.

on the symptom of postnasal discharge. He also explains the normal functioning of the nasal and sinus mucosa and tells about the common anatomic and pathologic conditions that may predispose to infection. The diagnosis and treatment of acute and chronic conditions are given in simple terms so that the layman may have a rational understanding of the mechanisms involved. It is a good article and one that a great many patients might benefit from reading.

Davy [131] lists the following predisposing factors in the etiology of rhinitis: bad housing, unbalanced diet, unsuitable clothing, overcrowded, ill ventilated public places, fatigue, exposure, alcohol and tobacco, drying effects of central heating, familial infectivity, diving and swimming and others. Local factors are thickened membranes, hypertrophied turbinate bones, polypi, septal deviations and enlarged adenoids. He discusses the symptoms of acute sinusitis, with the typical sites for pain, which are not always present. Among the diagnostic procedures mentioned, roentgenologic examination and "diagnostic exploral suction" as described by Watson Williams are given particular mention. The latter refers to the instillation of sterile isotonic sodium chloride solution into the sinus, which is then withdrawn and examined bacteriologically. He states that it can be successfully accomplished for the antrum and the sphenoid and posterior ethmoid sinuses.

The therapy in acute and subacute cases consists of rest in bed, the administration of abundant fluids and adequate diet and relief of nasal congestion by inhalations of vapor impregnated with menthol and compound tincture of benzoin. He avoids the local use of vasoconstrictors, sulfonamide compounds and argyrol® (a silver vitellin preparation). If retention of secretions gives rise to pain, he suggests using 0.25 per cent phenylephrine hydrochloride (neosynephrine hydrochloride®) or 1 per cent ephedrine sulfate as a spray or applied locally by means of swabs. Also, elixir neo-synephrine® may be given orally.

Putney [132] gives a general review of the entire subject of sinusitis, with special consideration of different types, such as allergic, mechanical and bacterial sinusitis, and the various complications such as optic and orbital disturbances and osteomyelitis. He decries the overuse of vasoconstrictors and sulfonamide compounds locally and favors spot suction and the local use of penicillin solutions. Mechanical sinusitis indicates those local factors which interfere with ventilation and drainage of the sinuses, namely, high septal deviations, polypi, cystic middle

131. Davy, A. O.: Nasal Sinusitis, Bull. Post-Grad. Comm. Med.; Univ. Sydney **2**:219 (March) 1947.

132. Putney, F. J.: Nasal Accessory Sinus Disease, M. Clin. North America **31**:1344 (Nov.) 1947.

turbinate bone, cysts and tumors as well as the irritating effects of caustic vapors and unsuitable locally applied medicaments.

In general, the author stresses conservative measures in most cases, surgical treatment being reserved for the long-standing stubborn cases or for the removal of diseased tissue which is beyond spontaneous recovery.

Putney's article [133] in the *Laryngoscope* covers substantially the same ground as the one referred to in the preceding paragraph.

King [134] describes his procedure in cases in which symptoms of nasal obstruction, headache and postnasal discharge suggest a chronic sinus condition. Allergy is considered in this connection, and the family and personal history are thoroughly investigated. A nasal smear is next taken. The sinuses are examined in the routine manner and roentgenograms studied. If it is indicated, the sinuses may be irrigated. Nasal obstruction due to deviated septum from polyps is corrected. Cutaneous tests are performed but not relied on entirely. It is necessary to inquire into the living conditions or working environment of the patient. When symptoms are most marked during the winter, house dust may be the offender, and many patients find relief after small graduated doses given by injection.

Littell [135] states that chronic sinusitis can be cured if the case is carefully studied and the individual contributory factors properly evaluated and eliminated. He lays considerable stress on the importance of freeing the upper air passages for adequate ventilation of the meatuses. High deviations, in his experience, are frequently the cause of a persistent sinus infection. Radical operation is seldom necessary if these elements are given proper consideration. In most cases the procedures that will facilitate drainage and ventilation are likely to yield the best results.

Treskow [136] discusses in detail the factors which may impair the normal passage of air currents through the nose, beginning with malformations of the nares and going back to the nasopharynx. Citing Proetz and Hilding's experiments on the normal airflow and action of the cilia, he stresses the importance of maintaining proper airways. Nasal obstruction, postnasal discharge and other symptoms currently charged to sinus disease may all be the results of improper aeration.

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133. Putney, F. J.: Changing Concepts of Sinusitis, Laryngoscope **57**:664 (Oct.) 1947.

134. King, E. D.: The Classification and Treatment of Patients with Chronic Nasal Symptoms, Ann. Otol., Rhin. & Laryng. **56**:70 (March) 1947.

135. Littell, J. J.: Correction of Chronic Sinusitis, J. Indiana M. A. **40**:1226 (Dec.) 1947.

136. Treskow, F. G.: The Importance of Adequate Nasal Ventilation, Wisconsin M. J. **46**:604 (June) 1947.

An analysis of each individual case, together with an evaluation of a possibly allergic factor, calls for careful examination and study. Many physicians are prone to proceed immediately to treatment of the symptoms, without taking the time to study the case thoroughly.

ALLERGY

Gill [137] points to the significant fact that up to recent years the literature on rhinology made no mention of allergy while at the same time there was considerable discussion as to the why and wherefore of so many failures after operations on the sinus. Taken together with the better knowledge of nasal physiology, these account for the recent newer orientation in the evaluation of symptoms of sinusitis and therapy. Discussing the latter, Gill cites recent literature reporting good results from the use of penicillin inhalations and the injections of dust solutions in allergic cases and of antihistamine drugs in certain cases. In addition, he quotes Jarvis and Roberts, who have emphasized the importance of diets.

Grove,[138] analyzing a series of 200 cases of asthma with operation on the sinuses, finds that the best results were obtained in those in which the sinus mucosa was completely removed. In this group of patients 79.9 per cent were completely or definitely relieved. On the other hand, in a group of cases in which the sinuses were incompletely eradicated, good results were yielded in only 35.2 per cent. Those patients who had sensitization associated with their sinus infections showed 16.4 per cent greater improvement of the asthma. The best results were obtained in patients whose asthma began after the age of 21 in whom the condition had existed for less than five years.

The author stresses the importance of contrast mediums in the study of roentgenograms to determine the presence of definitely hyperplastic mucosa which serves as the focus of the persistent infection. Despite the allergic history in these cases and the presence of eosinophils, surgical intervention will yield good results if the diseased tissues are removed. Naturally, when possible all allergens should be removed or the patient should be desensitized.

Rawlins [139] points out that many cases of so-called chronic sinusitis are in reality cases of perennial nasal allergy. The common symptoms are stuffy nose, postnasal drip, frequent colds and fatigue. The diag-

137. Gill, E. K.: Modern Trends in Diagnosis and Treatment of Paranasal Sinus Disease, with Particular Reference to Allergic Manifestations, Texas State J. Med. **43**:330 (Sept.) 1947.

138. Grove, R. C.: Sinusitis and Allergic Diseases, Am. Pract. **1**:468 (May) 1947.

139. Rawlins, A. G.: Chronic Allergic Sinusitis (Perennial Nasal Allergy), Laryngoscope **57**:381 (June) 1947.

nosis can be made only by careful history taking and thorough examination, including smears and cutaneous testing. These are all gone into in detail and clearly outlined. The most common offenders are house dust, molds, tobacco smoke and paper. Desensitization is accomplished through combined intradermal and hypodermic injections of high dilutions, given frequently until the symptoms disappear and then continued without increment at longer intervals. The important thing is attaining the optimum dosage for the individual case and regulating the dosage according to the severity of the symptoms. The severer the symptoms, the smaller the dose. Injections should cease when the patient is comfortable and should be resumed if symptoms recur. Rest periods are important.

Chládek [140] finds that the cytologic examination of nasal secretions is a reliable guide for the determination of allergic factors in nasal conditions. He cites a number of authors, including Hansel, and describes several methods of staining and counting the cells. Repeated examinations are necessary in some cases because of changing conditions due to complicating infection, but the percentage of eosinophils is the determining factor in assessing the degree of the allergic influence. He also discusses several theories as to the origin and development of the eosinophilia, without coming to any definite conclusions. Several illustrative cases are cited.

Franchini [141] objects to the terms "allergic sinusitis" and "allergic rhinitis" on the ground that the process is not truly an inflammatory one. He suggests the following nomenclature:

1. "Rinosinusopatias infecciosa supurativas" to indicate a true infectious process, acute or chronic, with the usual pathologic changes in the mucosa and the predominance of leukocytes and lymphocytes in the secretions.

2. "Rinosinusopatias alergicas pura," in which there are no inflammatory changes in the mucosa but in which the process is a hyperergic one, with predominance of eosinophils in the secretions.

3. "Rinosinusopatias alergicas with secondary infection," in which both processes are present with one or the other being primary or secondary as the case may be.

Darrough [142] believes that 75 per cent of all chronic nasal conditions have an allergic background. Since a pathologic process is coexistent

140. Chládek, V.: Cytology of the Nasal Secretion with a Special Regard to the Diagnosis of Allergical Phenomena, Acta oto-laryng. **35**:508, 1947.

141. Franchini, Y.: Reacciones alérgicas rinosinusales, Semana méd. **54**:36 (Jan. 9) 1947.

142. Darrough, L. E.: Nasal Allergy Associated with Sinus Disease, Texas State J. Med. **43**:285 (Aug.) 1947.

in most cases, it is natural that the rhinologist should treat both conditions. He goes on to discuss the usual methods of determining the presence of allergy and the offending allergen.

Hanckel [143] had good results from the use of diphenhydramine hydrochloride (benadryl hydrochloride®) after polypectomy in 10 successive cases of chronic sinusitis. In most of the cases the polyps did not recur and there was considerable improvement in the subjective symptoms. The dosage given was 50 mg. four times daily. If drowsiness supervened, the drug was withheld for twenty-four hours and then given again. There is no record of the duration of the therapy or the relief obtained. The author suggests thorough investigation to identify the offending allergens when patients fail to respond to the therapy.

Hersh,[144] analyzing a series of 1,000 cases of headache, finds the commonest causes in order of frequency to be vasomotor rhinitis, myositis cervicalis, mechanical nasal obstruction, sinusitis and neuropsychiatric disorders. In 470 patients vasomotor rhinitis and myositis cervicalis were associated. Many of these were allergic. However, in some the muscular pain was a secondary reflex from a headache due only to the rhinitis. It is interesting to note that the sinuses were responsible for the headache less frequently than generally supposed. Also of interest is the comparatively large number (141) of cases in which the headache was due to neuropsychiatric disorders. The author found few cases of vascular cephalalgia, including only 5 cases of true histamine cephalalgia and 15 cases of migraine.

It is evident, therefore, that the patient with chronic headache must be studied thoroughly if the true cause is to be uncovered.

Kelly [145] gives a good historical survey of the progress of the present knowledge of headaches together with the development of research into the anatomy and physiology of the sinuses. Headache as a symptom of sinusitis was not recognized until 1880, although suppuration in the sinuses was described as far back as 1651. He quotes Buzoianu on the etiology of headaches of nasal origin, ascribing them to stimulation of the trigeminal-sympathetic system, an apparatus that controls the tonus of the nasal vascular apparatus and the endocranial membranes. He calls this "vago-nasal-hyper-sensitivity."

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143. Hanckel, N. W.: A Suggestion for the Treatment of Chronic Sinus Disease, J. South Carolina M. A. **43**:93 (April) 1947.

144. Hersh, J. H.: Some Present-Day Concepts of Headache: An Analysis of One Thousand Cases of Headache, Ann. Otol., Rhin. & Laryng. **56**:98 (March) 1947.

145. Kelly, D. B.: Headache and Sinus Disease, J. Laryng. & Otol. **61**:542 (Oct.) 1946.

Selz [146] describes the sensory innervation of the nasal cavities and sinuses and quotes McAuliffe, Goodell and Wolf on the relative sensitivity of the various areas. Since the mucosa of the sinus is less sensitive than that of the nasal chamber, it is difficult to interpret headaches commonly thought to be due to sinus infection. The author mentions the typical morning headache often encountered and then attempts to locate the sinus responsible by the area where the pain is experienced. He also mentions the differential diagnosis in cases of trigeminal neuralgia, temporomandibular pains, glossopharyngeal neuralgia and sphenopalatine neuralgia. The article is more or less sketchy.

Cora Eliseht and Montero [147] discuss the innervation of the nasal cavities and sinuses, mentioning the sensory, sympathetic and parasympathetic branches, the areas they supply and their function. Physiopathology, pathogenesis and various types of pain and headache are described, and much stress is laid on the effects of combined irritation of both sensory and sympathetic fibers. They point out the fact that the degree of pathologic change present in the nose is no criterion of the amount of pain that may result. Frequently minimal findings are observed in connection with severe pain and vice versa. They seem to think that neurovegetative disequilibrium accounts for most of the persistent pains in cases in which a pathologic process is absent or minimal. Also they stress the role of a high septal deviation in the causation of pains, citing typical cases.

DENTAL DISEASE

Stafne [148] states that the diagnosis of a dental root in the antrum depends on proper roentgen ray study. Usually the root is seen in its normal location. One case is reported in which a premolar root was found surrounded by a capsule of inflammatory tissue. Occasionally a small root or portion of root may be located between the mucosa of the antrum and its bony wall and is usually seen lying at an angle to its normal position and without the normal lamina dura which usually surrounds it. Such a root may act as a nidus for formation of a rhinolith, as was the case in another instance reported by the author. The opacity of a rhinolith does not vary much from that of tooth structure and diagnosis from the roentgenogram alone may be difficult. In the case reported the root was removed and sectioned, showing a true rhinolith developing around a thread 1 cm. long.

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146. Selz, S.: Sinus Headache, Cincinnati J. Med. **28**:30 (Jan.) 1947.

147. Cora Eliseht, F., and Montero, J.: Etiopatogenia de las cefaleas rinosinusales, Prensa méd. Argent. **33**:1018 (May 17) 1946.

148. Stafne, E. C.: Dental Roots in the Maxillary Sinus, Am. J. Orthodontics (Oral Surg. Sect.) **33**:582 (Aug.) 1947.

Cook [149] reports a case of maxillary sinus infection due to trauma. A man of 22 was struck over the left cheek, which resulted in swelling and infection. A dentist removed an upper left molar, releasing considerable pus. The relief, however, was not permanent, and two weeks later the roof of the mouth and the mucobuccal fold were incised and more pus drained. Since then there has been intermittent swelling, with periods of relief accompanied with a discharge from the nose. Roentgenograms showed a thickened membrane in the antrum, and a contrast medium outlined what looked like a cyst. A Caldwell-Luc procedure disclosed a dehiscence in the anterior wall of the antrum leading into a cystic cavity which extended below the floor of the nose and eroded the bony naso-antral wall. Histologic examination failed to identify a true cyst wall. Layers of columnar epithelium covered a dense fibrous submucosa infiltrated with polyps, plasma cells and some lymphocytes. The diagnosis was "chronic inflammation of the mucosa."

Moe [150] points out the importance of the rhinologist's becoming familiar with dental pathology to gain a better comprehension of the problem of sinusitis in relation to the teeth. As an example he cites a case in which the sinus symptoms strongly suggested a dental origin but in which the teeth apparently were normal and there were no roentgenologic evidences of pulp or apical infection. Careful reexamination of the first molar, however, disclosed an unusual finding. The probe found a passage in the palatine root which led directly into the antrum. Iodized poppyseed oil 40 per cent was injected, and the tract was clearly shown but only when roentgenograms were taken in several planes. Extraction was followed by prompt cessation of the nasal discharge and pain and other indications of involvement of the sinus. Paradentogenous infection of the antrum is therefore again proved in a case in which there was no apicitis and the pulp was vital.

Heterotopia, or anomalous situation of a tooth, may cause a sinus infection which manifests itself by swelling in an unusual location. Suárez [151] describes a case in which the swelling appeared in the cheek and discharged through a fistula located in the nasolabial fold. The tooth root was found close to the infraorbital foramen.

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149. Cook, T. J.: Maxillary Sinus Disease of Dental Origin, Am. J. Orthodontics (Oral Surg. Sect.) **33**:765 (Nov.) 1947.

150. Moe, R.: On the Genesis of the Dental Antrum Empyemas, Acta otolaryng. **35**:42, 1947.

151. Suárez, C.: Heterotopia dentaria y sinusitis maxilar, An. Casa de salud Valdecilla **9**:499, 1946.

FRACTURE; FOREIGN BODIES

Stewart and Botterell [152] state that satisfactory primary treatment of wounds involving the cranial-facial-orbital areas depends on the following factors:

1. Radical débridement of cranial and cerebral wounds.

2. Débridement of damaged paranasal sinuses, with establishment of adequate drainage through the nose.

3. Sealing of the subdural and subarachnoid spaces.

4. Closure of the scalp without damage and without drainage. The earlier this procedure is carried out, the better the prognosis. A delay of two or three days for transportation to a locale where adequate personnel is available is permissible if penicillin and sulfonamide drugs are given in the interim.

The details of the four principles mentioned are carefully gone into in the article. Two typical cases are presented, together with roentgenograms and photographs.

Complete primary closure of the scalp was carried out in 20 of 25 patients receiving primary surgical treatment, with only one instance of infection.

Calvert [153] contributes an extensive and detailed analysis of 57 cases of gunshot wounds involving the sinuses, liberally illustrated and replete with discussion of the why and wherefore of the therapy. The wounds are divided into three groups, namely, the frontocranio-orbital, in which the missile entered the frontal region and passed through the brain by way of the orbit and sinuses; the transorbitonasal, in which the missile passed horizontally across the upper part of the face, penetrating the sinuses and the orbit, and the facio-orbitocranial, in which the projectile entered the face below the supraorbital margin and passed upward and backward through the orbit and nose. In each group the problem was different, but in all of them the important consideration was the question of the location and extent of the damage to the dura and the possible consequences of its communication with the potentially infected sinuses. There were only 4 deaths in the series, which speaks well for the care with which the cases were studied and the therapy indicated.

In general it was agreed that thorough débridement of the wound, chemotherapy and early repair of the dural defect were essential. The

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152. Stewart, O. W., and Botterell, E. H.: Cranio-Facial-Orbital Wounds Involving Paranasal Sinuses: Primary Definitive Surgical Treatment, Brit. J. Surg., June 1947, War Surg. supp. 1, p. 112.

153. Calvert, C. A.: Orbito-Facio-Cranial Gunshot Wounds, Brit. J. Surg., June 1947, War Surg supp. 1, p. 119.

author found that his best results were obtained by the use of a wide exposure through a frontal osteoplastic flap, with intradural repair of the dural laceration by means of a fascial graft. This was demonstrated to be superior to the extradural approach because of a wider exposure and less trauma to the dura in the region of the cribriform plate, where it is so densely attached. The paper is well worth reading in its entirety.

Following along the same lines, Johnson and Dutt [154] present their analysis of 20 similar cases in which there were 7 deaths. They stress particularly the pathologic aspects of the cases and go into great detail describing the roentgenologic findings. Taken together, these factors made for a better understanding of the mechanics involved and led the way to a proper diagnosis of the extent of the lesions and the therapeutic measures indicated. Typical case histories are given, and the roentgenograms and explanatory drawings give an exceptionally clear understanding of the problems encountered. The treatment depends not only on the type of lesion but on the patient's condition and the facilities at hand. It is agreed that the dural laceration should be closed, particularly if it is in the vicinity of one of the sinuses. Yet this procedure may have to be postponed until suitable facilities are provided. In any case, the wound must be excised and the defect covered, even if it means shifting the scalp, and the patient given antibiotic and supportive treatment until he can be transported to a more favorable locale for the complete repair. Indications for immediate treatment, as well as reasons for delay, are given in great detail according to the type of wound.

This report, in conjunction with the two preceding ones, offers the best summary of war experience of this type of lesion that has as yet appeared in current medical literature.

Klimpel's case [155] concerned a man of 23 who, five years previously, had sustained a cranial injury which rendered him unconscious for several days and was followed by attacks of jacksonian epilepsy lasting several months. The patient remained well up to four months before the time of writing, when he began having severe fronto-occipital headaches, mostly on the right side, intermittent purulent nasal discharge and frontopalpebral edema. Roentgenograms showed a fracture line dividing the right frontal sinus into two parts, the internal portion being clear and the external portion cloudy. Pus was seen bathing the middle turbinal bone. Operation disclosed the fracture line 3 cm. long extending from above downward into the sinus, which was filled with pus and

154. Johnson, R. T., and Dutt, R.: On Dural Laceration over Paranasal and Petrous Air Sinuses, Brit. J. Surg., June 1947, War Surg. supp. 1, p. 141.

155. Klimpel A., L.: Fractura del seno frontal complicada de sinusitis y osteomielitis localizada, Rev. otorrinolaryng. **7**:197 (Dec.) 1947.

polypoid membrane. The bone was soft and necrotic along the floor and the anterior wall. The supraorbital nerve was caught in the fibrous tissue filling the fracture line and had to be sacrificed. The posterior wall of the sinus was eroded, exposing the dura and the surrounding area of necrotic bone. There was a fibrous band dividing the sinus into two portions, the inner one being practically normal. Pus drained through it into the nasofrontal duct by way of a fistula which was partly blocked by granulations. These evidently were acting as a valve, which accounted for the intermittent discharge.

Goinard and Descuns [156] corrected a frontal depression by means of an iliac bone graft. The patient was a 23 year old man who was kicked in the head during a football match. The external plate of the sinus was fractured and depressed and, from the meager history obtained, was evidently removed, leaving a decided depression. Roentgenograms showed the posterior wall of the sinus intact. An osteoperiosteal graft was taken from the crest of the ileum and sutured into the defect after thorough cleansing and curettage of the sinus mucosa. A good primary result was obtained.

Among a series of 421 battle casualties involving the facial structures, Alexander [157] lists 56 cases in which the sinuses were affected. In 42 of these it was the maxillary sinus, in 10 the frontal sinus and in 4 the ethmoid sinus. The therapy in these cases consisted primarily in the thorough exposure of the sinus for removal of all foreign bodies, such as bone fragments, indriven tissue, explosive fragments and teeth, and provision for adequate drainage. In the case of the antrum the Caldwell-Luc approach was used and drainage by gauze packing effected through the nasoantral wall into the nose. Only such portions of the mucosa as were visibly destroyed were removed. The frontal sinus was exposed through a supraorbital incision and drained externally. The ethmoid sinuses were usually cleaned by way of the external wound, which in most cases was extensive. In the vast majority of cases local anesthesia, nerve block and adequate premedication were preferred to general anesthesia.

Ide's case [158] involved a man of 43 who had been shot through the cheek two months previously. Complaining of headache, he was admitted to the hospital, where roentgenograms showed fragments of a bullet in the floor of the orbit. It was removed through a transantral approach

156. Goinard, P., and Descuns, P.: Réparation d'une brèche osseuse frontale par greffe d'aile iliaque, Afrique franç. chir. **[4]**:162 (March-April) 1946.

157. Alexander, J. E.: Early Treatment of Maxillofacial Battle Casualties, Arch. Otolaryng. **45**:637 (June) 1947.

158. Ide, D.: Bullet in Right Orbit: Transantral Extraction, Eye, Ear, Nose & Throat Monthly **26**:205 (April) 1947.

as used for a Caldwell-Luc operation. A section of bone was removed from the roof of the antrum, exposing the bullet fragments, which were easily extracted.

Engler and Melant [159] report the removal of the end of a knife blade from the ethmoid labyrinth by the external route in a man of 34. The patient stated he had been stabbed by his wife in the region of the glabella about four years previously and had been suffering head pains ever since. Roentgenograms revealed the foreign body in the right anterior ethmoid cells.

Cantoni [160] reports a case in which a broken wooden pencil was removed from the ethmoid sinus, where it had been for four months. The patient was a 31 year old man who gave a history of having been stabbed "in the eye" during a drunken brawl. He was told at the time that the pencil had not penetrated deeply and that all of it had been removed. However, a granulating mass persisted in the lower conjunctival sac near the outer canthus. Nasal examination revealed a hard white elongated mass, firmly embedded between the lateral nasal wall and the septum at the level of the middle turbinate bone. Roentgenograms showed clouding of the sinuses but no definitely delineated foreign body. Most of the pencil was removed intranasally, and a small remaining fragment extruded spontaneously into the nasal cavity.

Apparently the pencil had been driven through the lamina papyracea and the posterior part of the ethmoid labyrinth, perforating the septum into the opposite nasal cavity.

Brunner and Buky [161] state that heredity must be considered as an etiologic factor in the Morgagni-Stewart-Morel syndrome. The headache and dizziness are not typical symptoms, yet they may be passed from mother to daughter. The dizziness is labyrinthine in character but probably central in origin and must be differentiated from that which is due to Ménière's syndrome.

Two typical cases are reported. A family tree in 1 case shows a number of blood relatives manifesting endocrine disorders such as obesity, abnormal calcium deposits and psychoneurotic symptoms.

Schachter's case [162] was of special interest. A 67 year old woman had undergone a mastectomy two years previously. A few months later

159. Engler, C. W., and Melant, J. H.: Foreign Body Involving the Ethmoid Sinus, Arch. Otolaryng. **45**:352 (March) 1947.

160. Cantoni, A. J.: Wooden Foreign Body in the Ethmoid Capsule, Ann. Otol., Rhin. & Laryng. **56**:953 (Dec.) 1947.

161. Brunner, H., and Buky, P. N.: Hyperostosis Frontalis Interna, Eye, Ear, Nose & Throat Monthly **26**:471 (Sept.) 1947.

162. Schachter, M.: Hallucinations morphopsiques par spasme vasculaire chez une malade atteinte d'hyperostose frontale interne (syndrome de Morgagni-Morel), Schweiz. Arch. f. Neurol. u. Psychiat. **58**:306, 1947.

one arm swelled up, but this subsided, leaving a persistent prickly sensation. At this time she began to complain of a visual disturbance in one eye which was in the nature of various optical illusions such as seeing butterflies, flaming objects and flashes. These hallucinations were attributed to a vascular disturbance in the occipital lobe, probably due to metastasis from the breast. However, the presence of obesity, virilism, hirsutism and positive roentgenologic evidence of frontal hyperostosis seemed to point to a Stewart-Morel syndrome. The Rorschach test was applied and revealed a psychoaffective personality of the egocentric type.

DeFinis [163] reports 6 cases of hyperostosis frontalis associated with obesity and other endocrine manifestations. He presents a rather complete review of the literature, with comments on theories of pathogenesis. He concludes that in his cases, at least, ovarian dysfunction seemed to play a greater role than pituitary disturbance, and some improvement was obtained from estrogenic therapy.

Rebattu [164] quotes several authors in support of a theory that agenesis of a frontal sinus may be responsible for persisting intractable headaches and cites a case in which surgical intervention was followed by relief. The operation consisted in excavating through the dense supraorbital bone to expose the nasofrontal duct. Two similar cases, with equally good results, are referred to. The pain in these cases is described as being located in the floor of the sinus, radiating toward the root of the nose and frequently to the temporal and occipital regions. It may be continuous or intermittent. It is usually accompanied with a sense of weight or pressure and occurs most frequently in young adults. At times the headaches are paroxysmal and may follow exposure to cold. The author believes that the pain is a trigeminosympathetic neuralgia created and maintained by the block of solid bone taking the place of a normally aerated frontal cavity.

McNicholas' patient [165] was a woman of 50 with a discharging sinus above the right eyelid for five months. There was no pain, but swelling was present for about two weeks. Also there was a history of headaches for more than a year. Six years previously the patient had suffered similar headaches and swelling but no discharge. A probe passed into the fistula entered the sinus. Roentgenograms showed a large frontal sinus. The superior orbital margin was depressed, and there was a

163. de Finis, A. B.: Hiperostose frontal interna, Rev. med. de cir. de São Paulo **6**:339 (July-Aug.) 1946.

164. Rebattu, J.: Traitement chirurgical des troubles dus à l'agénésie du sinus frontal, Bull. Acad. nat. méd. **131**:437 (June 10-17) 1947.

165. McNicholas, P. J.: Empyema of Frontal Sinus Simulating Osteomyelitis, Brit. M. J. **1**:850 (June 14) 1947.

doubtful sequestrum at the medial margin. The sinus was exposed through a Howarth incision and an empyema found in a cavity measuring 3½ by 2 by 2 inches (8.75 by 5 by 5 cm.) which had completely eroded the roof of the orbit to the level of the superior orbital fissure. Pulsation of the brain and meninges was plainly visible. The anterior wall of the sinus had been eroded. The nasofrontal duct was enlarged "in routine Howarth fashion" and the anterior ethmoid cells removed. A half inch (1.27 cm.) rubber tube was carried down into the nose. A full course of sulfathiazole and 3,000,000 units of penicillin were given, and the patient made an uneventful recovery.

Remaggi [166] reports 2 cases of cholesteatoma in the frontal sinus occurring in children of 14 and 13 years. In both instances the mass made its appearance several years previously, growing slowly and producing an external swelling which displaced the bulb and caused some pain. Operation revealed extensive absorption of bone in 1 case, and in both cases the sinus mucosa showed no evidence of infection. The author believes the condition to be true cholesteatoma and presents a résumé of previously reported cases, with the usual arguments pro and con as to whether the growth is congenital or secondary to a chronic infection. Roentgenograms and photomicrographs shown in the article are extremely clear.

Locke [167] relates his experience with reference to aerosinusitis among bombardiers flying at an average altitude of 20,000 feet (6,096 meters). He refers to Campbell's classification into three degrees and concerns himself mainly with patients in the third degree, that is, those in whom a hematoma develops in the sinus mucosa. In most of his cases the frontal sinus was affected, and several roentgenograms are shown delineating the outlines of the hematoma as well as the accompanying clouding of the other sinuses on the same side. The characteristics of the shadow produced by a hematoma are discussed. It is not always demonstrable in the first roentgenogram because the sinus may be full of blood or fluid. Repeated examinations are necessary to show the characteristic round shadow, and when it appears it must be differentiated from a cyst or polyp. Hematomas tend to fade out in time, whereas a cyst remains constant. An allergic history should clear up the question of polypi. On the other hand, with aerosinusitis one is likely to have a history of sudden pain and the appearance of blood in the nasal secretions. Stress is laid on the necessity for close cooperation between the rhinologist and the roentgenologist.

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166. Remaggi, P. L.: Osservazioni sui colesteatomi del seno frontale, Oto-rino-laring. ital. **14**:1, 1946.

167. Locke, J. A.: Aerosinusitis, with Special Reference to Roentgen Diagnosis Am. J. Roentgenol. **57**:298 (March) 1947.

Jemmi [168] reports 3 cases of aerosinusitis in fliers which appeared after rapid descent, with symptoms of severe localized pain followed by persistent headache. In all 3 cases there was a predisposing factor in the form of a deviated septum and turgescent turbinate bones. In 1 case the roentgenograms showed pronounced edema of the frontal sinus mucosa. Relief followed resection of the middle turbinal bone and the use of vasoconstrictors.

The author points out the importance of screening aviators for anatomic deformities which interfere with adequate ventilation.

Barnes [169] reports his results with thyroid therapy in a group of patients, mostly female, complaining of nasal engorgement and chronic tubal catarrh. In most of the cases the basal metabolic rate was below normal and the administration of thyroid extract together with the use of nasal vasoconstrictors and occasional cauterization of the turbinate bones yielded excellent results in the majority. The best results were obtained in the younger patients. The article fails to enlarge on the types of sinusitis encountered in the series.

Blastomycosis of the oral cavity is comparatively rare and may be overlooked. A case in point is reported by Erich [170] which involved a man of 51 who presented a mass on the top of the nose of two months' duration and a growth on the buccal surface of the left cheek. The lesion on the nose began like a small "boil," increased in size, became painful and failed to yield to the application of hot packs and cauterization. On examination it presented a warty, indurated, ulcerated mass, looking much like a malignant growth. The lesion in the cheek was a rough papillary growth about 2 cm. in diameter. Biopsies revealed blastomycetes in both lesions. The lesions were destroyed with surgical diathermy, resulting in considerable loss of tissue. This patient also had a mass in the right lung, which was thought to be due to blastomycosis. Roentgen therapy and increasing doses of potassium iodide over a period of three months resulted in disappearance of the mass. At this time there was no evidence of recurrence of the other lesions.

Bloch [171] cites a case in which a tumefaction of the cheek that resembled a dental cyst or enlargement of the maxillary sinus turned out

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168. Jemmi, C.: Il "vacuum sinus" nel volo a tuffo e nel volo di alta quota, Arch. ital. di otol. **56**:47, 1944-1945.

169. Barnes, L. S.: Relationship of Hypothyroidism to Chronic Sinusitis and Chronic Catarrhal Middle Ear Deafness, Bull. Acad. Med. Toronto **20**:161 (June) 1947.

170. Erich, J. B.: Blastomycosis of the Oral Cavity and Nose: Report of a Case, Am. J. Orthodontics (Oral Surg. Sect.) **33**:604 (Aug.) 1947.

171. Bloch, A.: Deux observations d'actinomycose amygdalo-mandibulaire et maxillaire supérieur, Ann. d'oto-laryng. **64**:300 (May-June) 1947.

to be a mycosis forming a soft gelatinous mass in which bright spangle-like accumulations of actinomyces were scattered throughout. The treatment was simple, and a cure was obtained.

Boggino and Insaurralde [172] report a case of leishmaniasis in a man of 50, dating back fifteen years, in which, together with pulmonary and laryngeal lesions, there was an involvement of the maxillary sinus. Autopsy revealed typical vacuolated cells, histiocytes and plasma cells in the thickened submucosa of the maxillary sinus.

Guerrier [173] states that syphilis in the superior maxilla is most likely to localize in the incisor tooth bud. However, in the case presented, the lesion developed in the sinus itself. A child of 10 had a dental abscess five years previously which left a draining fistula in the region between the upper incisors and molars. There had been some pain and a persistent nasal discharge. Roentgenograms showed involvement of the sinus and bony necrosis. Biopsy revealed giant cells and caseation. Wassermann and Kahn tests showed a 4 plus reaction.

Romero Diaz [174] had an interesting case involving a boy of 19 whose epistaxis was traced to a chronic infected antrum. Several nasal hemorrhages were finally controlled by packing. The source was not located in the nose. However, roentgenograms showed a cloudy antrum. Puncture and irrigation released some old blood clots, after which the roentgenograms revealed less cloudiness but a definitely thickened membrane. Also, examination of the ear showed a blue drum membrane, probably due to aspirated blood.

The author debates the question of whether the blood in the antrum may not have originated in the nasal cavity and either overflowed through the ostium or have been forced through by the packing. Against this hypothesis is the argument that with a swollen antrum mucosa it is likely that the ostium may have been blocked as well as the fact that in order for blood to enter through the ostium it would have to overcome the static resistance of air within it. Nevertheless, if blood could reach the middle ear through the eustachian tube, the possibility of it having entered the antrum from the nasal chamber through the ostium cannot be dismissed.

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172. Boggino, J., and Insaurralde, C.: Leishmaniosis cutaneo-mucosa con localización laríngea y maxilo-sinusal, An. Fac. de cien. méd., Asunción (no. 22) **5**:313, 1945.

173. Guerrier, Y.: Syphilis du sinus maxillaire, Rev. de laryng. **68**:68 (Jan.) 1947.

174. Romero Diaz, E.: Epistaxis of Sinusal Origin, J. Laryng. & Otol. **61**:266 (May) 1946.

Bergouignan [175] reports a case of a woman of 61 who for five years suffered progressive dementia, blindness and ataxia with general signs of intracranial pressure. There was a sudden discharge of cerebrospinal fluid from the nose, which was followed by relief of all symptoms of intracranial tension except blindness. The patient's mentality was restored to normal. Since she refused ventriculography, the author could only speculate that a neoplasm of the frontal lobe had eroded into the nasal cavity and the discharge of the fluid in effect decompressed the endocranium, which accounted for the relief.

Doucet and Garderes [176] report a case of severe occipital headache for about fifteen days, which was accompanied with paresis of the abducens nerve after five days. An operation was performed; the middle turbinate bone was removed and the sphenoid sinus opened up, which was followed by relief of the ocular paresis. There was a local hemorrhage on the eighth day, followed by attacks of sneezing. Recovery occurred after one month. (There was no description of the operative findings.)

Medwick and Hallberg [177] report a case of a diphtheria carrier, a man of 71 who had had a nasal discharge and irritable throat for several years. There was crusting in the nose, with definite atrophy of the mucosa, septum and turbinate bones and diffuse opacity of all the sinuses on roentgenologic examination. Conservative therapy had been tried unsuccessfully on a number of occasions. Consequently an operative procedure was undertaken. Bilateral intranasal antrostomies were done, and the lining membranes were found to be thickened. At the same time the granulating masses found in the nose were carefully removed. The patient received penicillin parenterally both preoperatively and postoperatively as well as penicillin aerosol. He was also given one injection of 20,000 units of antitoxin after the operation. Cultures taken on several occasions during the six weeks postoperatively were all reported sterile. This case points to the necessity of eliminating a pathologic process of the sinus surgically if necessary in the treatment of chronic diphtheria carriers with nasal symptoms.

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175. Bergouignan, M.: Rhinorrhée cérébro-spinale salutaire au cours d'une hypotension intracrânienne, Rev. de laryng. **68**:11 (Nov.-Dec.) 1947.

176. Doucet and Garderes: Un cas de paralysie de la VI[e] paire guerie par trépanation du sinus sphénoïdal, Rev. de laryng. **68**:16 (Nov.-Dec.) 1947.

177. Medwick, J. X., and Hallberg, O. E.: Treatment of Chronic Nasal Diphtheria Carriers: Report of a Case, Ann. Otol., Rhin. & Laryng. **57**:134 (March) 1948.

INTRACRANIAL COMPLICATIONS IN OTOLARYNGOLOGY

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THE DECREASED incidence, morbidity and mortality of intracranial suppuration complicating diseases of the ear, nose and throat, as reported in recent literature, is impressive and encouraging. The principal reason for this is the extensive use of chemotherapeutic and antibiotic agents. Interesting also are the observations of foreign clinicians on arachnoiditis of the cerebellopontile cistern.

The material is arranged as follows:

1. Meningitis
2. Osteomyelitis
3. Brain abscess, subdural and extradural abscess
4. Sinus thrombosis
5. Cystic arachnoiditis
6. Intranasal encephalomeningocele
7. Cerebrospinal rhinorrhea and repair of dural defects

MENINGITIS

Hlavacek [1] reports on the influence of sulfonamides on labyrinthitis complicating acute or chronic otitis media. The degree of secondary meningeal inflammation is directly reflected in the cell count of the cerebrospinal fluid. A progressive meningitis produces a progressive rise in the white blood cell count in the cerebrospinal fluid. Hlavacek considers this rise to be an indicator as to when labyrinthectomy should be done. All his patients received sulfonamides (dosage not given). Myringotomy and antrotomy were done when necessary. His criterion for when to do a labyrinthectomy was based not on the number of cells in the cerebrospinal fluid but on the tendency for that count to rise. Spinal taps were done twice daily. Labyrinthectomy was not done, even though the cell count was as high as 200 per cubic centimeter, as long as there was no tendency for that count to rise.

Labyrinthectomy was performed in only 1 of 7 cases of labyrinthitis following acute otitis media, but it was considered to be an essential

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1. Hlavacek, V.: The Influence of Sulfonamides on Labyrinthitis and on Indications for Operative Interventions in the Inner Ear, Acta oto-laryng. **35**:258-270, 1947.

procedure in all 5 cases resulting from chronic otitis media. Hlavacek believes that failure of sulfonamides to cure in the latter group was due to the chronic nature of the pathologic process. Bacteriologic studies revealed gram-positive organisms in 2 cases.

Among the rarer organisms causing meningitis is Friedländer's bacillus. Ghiselin and Robertson [2] note that only 13 cases of otogenous meningitis due to this organism have been reported in the literature and they add a case. Only 2 of the patients, including their own, survived. Their patient was treated by mastoidectomy and sulfadiazine therapy. Penicillin was given to combat secondary invaders.

Friedländer's bacillus is a gram-negative rod which grows on simple mediums. It is immunologically related to the type II pneumococcus and the bacillus of rhinoscleroma. It is grouped into classes A, B, C and X, class A being pathogenic for man. It causes a silent but extensively destructive mastoid infection similar to that of type III pneumococcus infections. The organism in the reported case was sensitive to streptomycin. The authors feel that early mastoidectomy is essential in such cases.

The routes by which infection may spread to the brain from the tonsillar fossa are discussed by Fein.[3] They are (1) by way of the perineural lymphatics and sheaths of the extracranial nerves, (2) by way of the parapharyngeal tissue space to the base of the brain, (3) by way of the internal carotid and vertebral arteries or their perivascular structures and (4) retrograde extension of a thrombosis of the peritonsillar veins to either the cavernous or the lateral sinuses. He presents a case in which the meningitic symptoms began twenty-six hours after tonsillectomy. The organism was not identified. Recovery followed administration of large doses of sulfadiazine and penicillin. The author believes that because of the rapidity with which the complications developed the infection was due to either bacteremia or to organisms introduced by needle puncture of the carotid artery at time of operation.

Otenasek and Fairman [4] experienced unhappy results in 2 patients in whom they used tyrothricin irrigations (1:10,000) following radical operations on frontal and ethmoid sinuses. In both patients chemical meningitis developed. There was an initial acute phase immediately following irrigation, characterized by severe headache, delirium and shock. All cells in the cerebrospinal fluid in this stage were polymorphonuclears. Later, in the subacute stage, there was a preponderance

2. Ghiselin, A. D., and Robertson, R. B.: Friedlaender's Bacillus Meningitis Secondary to Otitis Media: A Report of a Case with Recovery and a Review of the Literature, Arch. Otolaryng. **45**:432-445 (April) 1947.

3. Fein, H. S.: Acute Pyogenic Meningitis Following Tonsillectomy with Recovery, Ann. Otol., Rhin., & Laryng. **57**:207-215 (March) 1948.

4. Otenasek, F. J., and Fairman, D.: Chemical Meningitis Following Use of Tyrothricin, Arch. Otolaryng. **47**:21-28 (Jan.) 1948.

of mononuclear cells. There was then a stage of apparent cure and relief of symptoms, followed by a third stage, of increased intracranial pressure, meningeal irritation and a communicating hydrocephalus. One of these patients died, and an opening in the dura could be demonstrated at postmortem examination.

The pathologic process was reproduced in dogs by injecting tyrothricin into the subarachnoid space. The resulting hydrocephalus was found to be due to a thickening of the meninges of the basal cisternae.

OSTEOMYELITIS

In the past, osteomyelitis of the basisphenoid and basiocciput almost always resulted in death from meningitis. These bones of the base of the skull depend on adjacent periosteum for their blood supply. Spar and Williams [5] state that anything which interferes with this blood supply leaves the bone vulnerable to necrosis and infection. They saw a patient who had had continuous anterior and posterior nasal packing for two weeks because of severe epistaxis. An abscess developed in the basisphenoid and basiocciput, accompanied with a reactive meningitis. Paralysis of the ninth, tenth and twelfth cranial nerves followed. The condition of the patient improved with large doses of sulfadiazine and penicillin. Complete recovery, however, followed only wide incision of the vault of the nasopharynx and posterior pharyngeal wall with evacuation of pus. In such cases trauma and infection of the nasopharyngeal mucosa probably leads to thrombophlebitis of the vessels supplying the bone, and osteomyelitis results.

An interesting case of osteomyelitis of the left parietal and frontal bones complicating frontal sinusitis is recorded by Lewis.[6] There was a left-sided extradural abscess together with left hemiplegia. As both frontal sinuses were infected, a deep-seated abscess of the right frontal lobe or a right subdural abscess had to be considered. This was ruled out as far as possible by exploration. The author believes that possibly the hemiplegia was caused by a thrombosis of the superior longitudinal sinus and superficial cerebral veins. Penicillin was given. Surgical intervention was limited to removal of all necrotic bone. The patient recovered.

Glass [7] reports a case of osteomyelitis of the frontal bone following acute frontal sinusitis with recovery. Penicillin was given parenterally.

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5. Spar, A. A., and Williams, H. L.: Osteomyelitis of the Basisphenoid and Basiocciput with Meningitis and Cranial Nerve Palsies as a Complication of Nasopharyngeal Packing for Control of Epistaxis: Report of Case with Recovery, Arch. Otolaryng. **46**:473-477 (Oct.) 1947.

6. Lewis, R.: Osteomyelitis of the Skull Complicating Frontal Sinusitis, J. Laryng. & Otol. **62**:88-92 (Feb.) 1948.

7. Glass, G.: Case of Osteomyelitis of Frontal Bone Following Acute Frontal Sinusitis, Treated by Surgery and Penicillin, J. Laryng. & Otol. **62**:310-313 (May) 1948.

Operation was necessary to remove dead bone and drain a subdural abscess. Repeated irrigations of the wound with penicillin were carried out through drains.

McKenzie's [8] experience with osteomyelitis of the frontal bone was similar. He concludes that (1) only limited surgical treatment is required when penicillin is given and that (2) administration of penicillin must be continued two to three weeks after infection has subsided to prevent a recurrence.

BRAIN ABSCESS, SUBDURAL AND EXTRADURAL ABSCESS

Localized nonsuppurative otitic encephalitis is described by Richtner [9] as an uncommon complication of acute or chronic otitis media or mastoiditis. This focal nonsuppurative infection of the brain involved the cerebrum more commonly than the cerebellum. It occurred twice as often after acute as after chronic infections of the ear. It could not be distinguished clinically from an early brain abscess. Its true nature was established by its relatively mild course and by the absence of pus on needling the brain. The author considers the following tracts as possible routes of infection from the ear to the brain: (1) the labyrinth and internal acoustic meatus, (2) the diploic and meningeal lymph channels and (3) the subarachnoid space.

The commonest symptoms of the cerebral type were: (1) headache, (2) nausea and vomiting, (3) aphasia (in 11 of 15 cases of left otitis media), (4) facial paralysis of the contralateral side (in 11 of 32 cases), (5) hemiplegia and convulsive seizures (in 16 of 32 cases) and (6) homonymous hemianopsia. In the less common cerebellar infections the commonest symptoms were dysmetria, cerebellar nystagmus and adiodokokinesis. Papilledema was usually absent. Spinal puncture usually revealed increased albumin and small numbers of lymphocytes.

Only 4 deaths occurred in the 32 cases reviewed. Recovery was the rule, with disappearance of paresis and aphasia in two to three weeks. Treatment of this localized nonsuppurative brain infection consisted in immediate mastoidectomy, including exposure of the dura. Chemotherapy, including use of penicillin, was advocated. If there was unsatisfactory improvement, encephalograms and ventriculograms were made, followed by incision of the dura and needling of the brain when necessary.

In discussing otogenic brain abscess, Jongkees [10] points out that the choice of treatment varies greatly among surgeons. Some advocate

8. McKenzie, W.: A Case of Osteomyelitis of the Frontal Bone Treated by Penicillin, J. Laryng. & Otol. **62**:33-35 (Jan.) 1948.

9. Richtner, N. G.: An Encephalitis Otogenica Localisata Non Suppurativa, Acta oto-laryng. **35**:156-179, 1947.

10. Jongkees, L. B. W.: Otogenic Brain Abscess: Report About Two Cases, Cured After Puncture and Penicillin-Treatment, Acta oto-laryng. **35**:225-230, 1947.

immediate operation, whereas others prefer to defer operation until an abscess membrane has formed. The otologic surgeon usually prefers the aural route to the abscess, whereas many others would rather drain the abscess via a clean extra-aural approach. Some have advocated large drainage routes, and others prefer to drain the abscess with a needle.

Jongkees states that statistics from Germany indicate that almost 100 per cent of patients with cerebellar abscess die and the results in patients with abscesses of a temporal lobe are also poor. He notes, however, that in England 25 per cent of patients with cerebellar abscess and 50 per cent with temporal lobe abscess survived. He successfully treated 2 patients, 1 with a temporal lobe abscess and the other with a cerebellar abscess. These were needled through the dura at time of mastoidectomy. Pus was aspirated, and penicillin solution (10,000 units per cubic centimeter) was instilled directly into the abscess cavity. Penicillin was also given intramuscularly to both patients.

According to Waltner,[11] the usual course of frontal lobe abscess of otogenic origin begins with a stage of severe headache, convulsive seizures, slow cerebration, apathy and confusion. The second stage consists in apoplectiform hemiplegia on the contralateral side. Meningeal signs are uncommon in these cases. He presents a case, however, in which the frontal lobe abscess appeared on the side contralateral to the infected ear and the initial symptom was ipsilateral hemiplegia. In this case also all the signs of severe meningitis except positive cerebrospinal fluid culture were present. Hemolytic streptococci were cultured from the ear. Meningeal symptoms cleared, but destruction of the mastoid process continued in spite of large doses of sulfadiazine and intrathecal and intramuscular injections of penicillin. On the thirtieth day a simple mastoidectomy was done, and on the fifty-fifth day the contralateral frontal lobe abscess was drained. The cerebral cortex was incised and a drain left in the abscess cavity, into which 30,000 units of penicillin was instilled daily. Recovery was complete. Waltner feels that this case lends support to the theory of a retrograde venous spread of the infection from the right mastoid process into the left frontal lobe rather than an arterial metastatic spread.

An otogenic cerebellar abscess may develop and increase in size insidiously, attaining huge dimensions with few signs. A slight intermittent frontal or occipital headache may be the only clue. Such are the observations of Asherton.[12] He further states that early diagnosis depends on daily neurologic examination to detect (1) persisting nuchal rigidity, (2) nystagmus of pendular type, (3) arm symptoms, such as

11. Waltner, J. G.: Otogenic Abscess of the Contralateral Frontal Lobe, Arch. Otolaryng. **45**:375-381 (Sept.) 1947.

12. Asherton, N.: Cerebellar Abscess, Acute, Otogenic, J. Laryng. & Otol. **62**:278-307 (May) 1948.

homolateral past pointing, dysdiadokokinesis and ataxy. Early manometric reading of the cerebrospinal fluid and differential cell count are of paramount importance in early diagnosis. Asherton noted in his cases that when the pressure was below 200 mm. of water the abscess was usually below the tentorium, and when over 300 mm. of water pressure, above the tentorium. He feels that the diagnosis of cerebellar abscess indicates an immediate surgical exploration.

Gurdjian and Webster [13] review their experiences with intracranial suppuration. The origin of infection in 16 cases was as follows: paranasal sinuses, 8; middle ear, 6, and trauma, 2. Hemolytic streptococci and Staphylococcus albus were the commonest offenders.

The anatomic distribution of the abscesses was as follows: cerebral, 11; subdural, 3; cerebellar, 2, and extradural, 1. Subdural abscesses were treated by multiple trephine openings, exploration of the cerebral cortex bilaterally and instillation of penicillin into the abscess space. Successful management of brain abscess depends on development of resistence in the host and localization of the infectious process. Single or repeated tapping to relieve tension was combined with instillation of penicillin directly into the abscess cavity. All but 2 patients recovered. In 2 cases of cerebral abscess, treatment was followed by recurrence; in 1 of these the abscess was excised, and in the other cure followed retapping and instillation of penicillin.

Gurdjian and Webster advocate a steplike plan of treatment, beginning with simple surgical procedures and followed by more radical measures when necessary.

Anderson [14] reports 3 cases of subdural empyema with 2 deaths. In the first case the purulent frontal sinus disease produced no local symptoms, the nature of the illness was not realized, operation was not performed and the patient died. In the second case the history of frontal sinusitis was not clearly elicited until the condition of the patient became hopeless. Operation was performed early in the third case, before irreparable damage had been done to the brain, and the patient recovered. All patients received repeated intrathecal injections of 15,000 units of penicillin. The author notes that subdural empyema should be suspected when an active sinus infection is followed by persistent headache, malaise, fever and chills, meningeal signs or lethargy. The appearance of focal or generalized convulsions, hemiparesis, aphasia or deviation of the eyes demands immediate surgical drainage.

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13. Gurdjian, E. S., and Webster, J. E.: Observations on Standardizing the Surgical Management of Intracranial Suppuration, J. Neurosurg. **5**:1-10 (Jan.) 1948.

14. Anderson, F. M.: Subdural Empyema Secondary to Frontal Sinusitis, Ann. Otol., Rhin. & Laryng. **56**:5-17 (March) 1947.

Thirty-seven patients with infections of the skull and central nervous system were treated by Naffziger and co-workers.[15] Nine of the 12 patients with pneumococcic meningitis recovered. The cerebrospinal fluid cultures of all patients who survived were sterile in twenty-four to seventy-two hours after combined systemic and intrathecal administration of penicillin. Two patients with streptococcic and 1 with staphylococcic meningitis recovered, although 1 of the former was left with severe mental impairment. In 8 cases of osteomyelitis of the frontal bone treated with penicillin the immediate results were good. Recurrences took place, however, unless surgical excision of the infected areas was carried out.

The efficacy with which penicillin penetrates the blood-brain barrier in normal and in abnormal conditions is not fully known. It is generally conceded that adequate concentrations of penicillin cannot be maintained within the cranial cavity by intermittent systemic administration of the drug in reasonable doses. There have been varying reports as to the toxic effect of penicillin in direct contact with nerve tissue. With purification of penicillin, reactions have been fewer. Parenteral administration has been supplemented by intrathecal and intracisternal injection with success in many cases. More recently intraventricular injections of penicillin have been used with success. Wyke [16] has used the method to treat purulent intracranial infections caused by penicillin-sensitive organisms in which (1) the cerebrospinal fluid cell counts are high, (2) cerebrospinal fluid block is present and/or (3) brain abscess is present and (4) in other serious cases. The lateral ventricles were punctured and cerebrospinal fluid removed. If the fluid was turbid or cerebrospinal fluid block appeared to exist, the ventricles were washed with Ringer's solution. Up to 5 cc. of solution containing 10,000 units (total) of "pure" penicillin was injected into the ventricles. This procedure was repeated daily. It was used as an adjunct to timely surgical procedures.

SINUS THROMBOSIS

A case of cavernous sinus thrombosis following extraction of a third molar tooth is presented by Orton.[17] The pathway of infection was thought to be by way of the pterygoid plexus via an emissary vein to

15. Naffziger, H. C.; Warmer, H.; Stern, W. E.; Fenlow, R., and McCorkle, H. J.: Penicillin in Infections Involving the Central Nervous System and Skull, J. A. M. A. **131**:1183-1185 (Aug. 10) 1946.

16. Wyke, B. D.: The Treatment of Severe Intracranial Infections by Repeated Intraventricular Injection of Penicillin, Surg., Gynec. & Obst. **85**:340-359 (Sept.) 1947.

17. Orton, H. B.: Cavernous Sinus Thrombosis Following Tooth Extraction, Laryngoscope **57**:294-298 (April) 1947.

the cavernous sinus. A total of 6,220,000 units of penicillin, 205 Gm. of sulfadiazine and four transfusions were given. The pharyngomaxillary, pterygoid and carotid spaces were widely opened and drained. Recovery was complete.

According to Harpman,[18] surgical treatment of the lateral sinus in otogenic blood stream infection since the advent of chemotherapy should be limited to drainage of pus and removal of loose infected clot without breaking down protective barriers. His experience further indicates that surgical procedures on the jugular vein should be restricted mainly to drainage. Resection of the vein is indicated occasionally when it is the seat of suppurative thrombophlebitis. He states that sudden interruption of a patent jugular vein or lateral sinus should not be considered lightly as it has resulted in serious intracranial disturbances.

A case of thrombosis of the facial veins as a complication of otogenous sinus thrombosis is reported by Hibler,[19] the third case recorded in the literature. The patient underwent radical mastoidectomy with ligation of the jugular and facial veins for lateral sinus thrombosis. Postoperatively there was moderate swelling of the face and eyelids on the treated side, followed by the formation of abscesses along the course of the anterior facial vein. The ligated stump of the facial vein was found to contain pus, and, in order to prevent a cavernous sinus thrombosis, the angular vein was also tied and divided. The patient recovered.

Thrombosis of the cavernous sinus continues to have a grave prognosis in spite of the advances in the use of chemotherapy, anticoagulants and antibiotics. Such is the experience of Fox and West.[20] They report 3 cases, 2 with unilateral involvement and 1 with bilateral involvement, with 1 death. In the first case the condition was thought to follow tonsillectomy and adenoidectomy, and the patient died in spite of administration of sulfadiazine sodium intravenously and penicillin intramuscularly. They consider anticoagulant therapy to be of great value in the treatment of cavernous sinus thrombosis and suggest the use of both heparin and dicumarol.® Intravenous administration of heparin produces an almost immediate but fleeting prolongation of the prothrombin time, whereas oral administration of dicumarol® produces a delayed but more sustained prolongation of the prothrombin time. Dicumarol® was given in their third case along with sulfadiazine orally and penicillin intramuscularly, and, although there was bilateral involvement of the cavernous sinus, the patient recovered.

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18. Harpman, J. A.: Treatment of Otogenic Blood Stream Sepsis, J. Laryng. & Otol. **62**:11-21 (Jan.) 1948.

19. Hibler, N.: On a Case of Otogenous Sinus Thrombosis with Thrombosis of the Facial Veins, Monatsschr. f. Ohrenh. **81**:32-35 (Jan.) 1947.

20. Fox, F. L., and West, G. B., Jr.: Cavernous Sinus Thrombosis, J. A. M. A. **134**:1452-1456 (Aug. 23) 1947.

CYSTIC ARACHNOIDITIS

An abstract of Hald's lucid article on arachnoiditis of the cerebellopontile cistern [21] follows.

From the older concept of serous meningitis two more well defined but rare conditions are now emerging: 1. Otitic hydrocephalus, occurring mainly in children and young adults. An acute otitis media is followed by the appearance of choked disk, frontal headache, attacks of vomiting and often abducens paralysis. The spinal fluid is clear and under increased pressure. There is a tendency toward spontaneous recovery. Treatment consists in repeated cisternal or ventricular punctures. Some investigators believe that the condition results from toxic stimulation of the leptomeninges, whereas others assume a difficulty in efflux of cerebrospinal fluid due to sinus thrombosis. 2. Arachnoiditis of the posterior fossa. Causes for this condition which seem fairly definite are: (*a*) Trauma; (*b*) otitis media, usually chronic; (*c*) tumor (arachnoid cysts have been found to overlie brain tumors). In those cases due to infection the pathway is not known. The cerebellopontile angle is triangular with its base located medially and its apex laterally. Its lateral projection is in relationship with the seventh, eighth, ninth and tenth cranial nerves. The pathologic changes consist in thickening of connective tissue, vascularization, and round cell infiltration of the arachnoid membrane.

The duration of symptoms in the 4 cases of arachnoiditis reported by Hald varied from five weeks to seven years.

1. Loss of hearing on the involved side was present in all cases and represented the first symptom. There was unilateral complete deafness in three. In 1 case there was unilateral loss of caloric response, which returned following surgical intervention.

2. In all cases there was dizziness, associated in some with spontaneous nystagmus (severe in 3 of the 4 cases).

3. Pressure headaches, nausea and vomiting were severe in 3 cases. Choked disks were seen in only 1 case. Cerebrospinal fluid pressures were not elevated.

4. Other cranial nerves were involved: the facial nerve in 2 cases, the abducens nerve in 2 and the trigeminal nerve in one.

Dilatation of the internal acoustic meatus, which is not part of the syndrome, was seen in one case.

The cause in these cases was obscure. One patient had a past history of encephalitis; another had a history of syphilis; the third had suffered trauma to the head, and in the fourth patient there was no clue as to cause.

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21. Hald, E.: Arachnoiditis of the Cerebellopontine Cistern, Acta oto-laryng. **35**:377-389, 1947.

At operation Hald found cystic collections of milky or xanthochromic fluid in the cerebellopontile angle, varying in amount from a tablespoon to a quantity filling a walnut-sized cyst space. Of the 3 surviving patients, aged 10, 6 and 3 years, 2 were perfectly well and a third much improved. The fourth patient died of unknown causes two years after operation.

Arachnoiditis of the cerebellopontile angle cannot definitely be differentiated from acoustic neurinoma preoperatively.

Preber [22] reports 2 similar cases, with spontaneous recovery in 1 and recovery following operation in the other. One case was particularly interesting. A patient with a typical history and clinical findings noted that something seemed to "crackle in her head" and had immediate relief of headache and instantaneous improvement in hearing (substantiated by audiometry). The author suggested that there may have been a spontaneous rupture of an arachnoid cyst in this case.

He reminds us that Barany first described the syndrome in 1912. Barany's syndrome consisted of unilateral occipital headache, tenderness on pressure above the mastoid, deafness, tinnitus, decreased caloric response, past pointing, facial palsy, diplopia, disturbance of taste in the posterior one third of the tongue, dizziness and vomiting. Some symptoms might be absent but deafness was always present.

INTRANASAL ENCEPHALOMENINGOCELE

Gisselsson [23] enumerates the theories as to the cause of encephalomeningocele as follows: (1) defects in bone development with resulting dehiscenses (Klimentowsky); (2) embryonic maldevelopment due to imperfect midline union of germinal membranes (Rokitansky); (3) increased fluid pressure in one of the ventricles of the brain during embryonic development (Springer); (4) adhesions of brain anlage to germinal membranes, resulting in herniation (St. Hiliare). The fourth is the theory most commonly accepted.

By anatomic distribution, Gisselsson distinguishes three main types: (1) occipital; (2) sincipital, in which herniation is visible in one of the following locations: (*a*) nasofrontal, (*b*) nasoethmoidal, (*c*) naso-orbital; (3) basal—(*a*) sphenopharyngeal, protruding down between the sphenoid and ethmoid bones into the epipharynx; (*b*) intranasal, through the lamina cribrosa into the nose; (*c*) spheno-orbital, through the superior orbital fissure into the orbit; (*d*) sphenomaxillary, through the superior orbital fissure, down through the inferior orbital fissure and into the sphenomaxillary fossa.

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22. Preber, L.: "Arachnoiditis" in Fossa Cranii Posterior of Otological Interest, Acta oto-laryng. **35**:271-290, 1947.

23. Gisselsson, L.: Intranasal Forms of Encephalomeningocele, Acta oto-laryng. **35**:519-531, 1947.

The author notes the following symptomatology of importance in diagnosis of the intranasal type of encephalomeningocele: (1) presence of a mass in the nose or nasal obstruction occurring at birth or in early childhood; (2) widened nasal root or increased pupillary distance; (3) presence of a mass in the roof of the nose with mucous membrane of the septum reflected over it; (4) a similar mass in the nose, often associated with an external encephalomeningocele; (5) fluctuations in size or fluctuations synchronous with changes in cerebrospinal fluid pressure; (6) cerebrospinal rhinorrhea following puncture or excision; (7) roentgen appearance of haziness over the ethmoid area, without other visible defects in the bones.

Anderson [24] states that needle puncture, biopsy or intranasal excision of intranasal encephaloceles almost always result in cerebrospinal rhinorrhea and meningitis. If the patient survives, there is always danger of meningitis with every infection of the upper respiratory tract.

The intracranial approach with use of a unilateral or bilateral frontal bone flap affords a better exposure and better means of securing tight closure of the dural defect in these cases than any other of the present methods of intranasal treatment. The frontal lobe is retracted intradurally. If the protruding encephalocele cannot be delivered into the intracranial cavity, it is ligated at the stalk and brain tissue carefully wiped out of the sac. The defect in the bone is closed tightly by covering it with bone, tantalum or muscle and suturing dural flaps or fascia over this. The thin-walled empty sac remaining in the nose collapses and causes no symptoms.

CEREBROSPINAL RHINORRHEA AND REPAIR OF DURAL DEFECTS

Dural tears occurring during surgical procedures on the temporal bone should be repaired during the same operation, according to Lillie and Spar.[25] Spicules of bone should be removed, and bony edges should be rounded off. The dural edges of the rent can usually be sewed together with silk sutures. If the rent is too large or the dura too friable, cellucotton® can be packed against the defect or animal membrane can be placed over it. In the authors' experience, fluid escaping from a fistula in the bony labyrinth healed spontaneously almost without exception. Lillie and Spar also note that postoperative cerebrospinal otorrhea which continued for three weeks and did not diminish would not heal spontaneously. Surgical closure was then performed.

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24. Anderson, F. M.: Intranasal (Sphenopharyngeal) Encephalocele: A Report of a Case with Intracranial Repair and a Review of the Subject, Arch. Otolaryng. **46**:644-654 (Nov.) 1947.

25. Lillie, H. I., and Spar, A. A.: Escape of Cerebrospinal Fluid into the Wounds of Operations on the Temporal Bone, Arch. Otolaryng. **46**:779-788 (Dec.) 1947.

Ecker [26] presents 4 cases in which drainage of cerebrospinal fluid from the nose occurred in patients with lesions of the posterior or middle fossa. The cerebrospinal rhinorrhea resulted from either traumatic or operative fracture of the temporal bone. In these cases the cerebrospinal fluid apparently entered either the middle ear or the mastoid cells and thence drained into the nasal cavity via the eustachian tube. Two patients survived, and the other 2 died of meningitis.

Haardt [27] opened the internal acoustic meatus during a surgical procedure on the labyrinth in a patient with chronic suppurative otitis media and labyrinthitis secondary to cholesteatoma. Cerebrospinal otorrhea resulted. On the fifth postoperative day the cerebrospinal otorrhea stopped. On the sixth day bubbles were noted at the internal acoustic meatus. Roentgenograms then demonstrated air in the anterior horns of the ventricles and the subarachnoid space. In spite of ventricular puncture to release air and fluid and administration of penicillin, the patient died on the twentieth day.

Cloward and Cunningham [28] used the gelatin sponge to cover and close dural defects intracranially in 3 cases. They felt that a fatal intracranial infection through a cranionasal opening was prevented in 2 cases. A chronic cerebrospinal rhinorrhea was arrested by use of the gelatin sponge in another case.

Spontaneous cerebrospinal rhinorrhea is discussed by Love and Gay.[29] Two of their cases support the observations of others that infection of the upper respiratory tract may be the precipitating factor in the production of cerebrospinal rhinorrhea in the presence of a congenital defect of the cribriform plate. They repaired the defect in their cases by the intracranial approach. Wax was used to plug the bone defect, and dura was approximated and sutured over the wax. Fibrin foam soaked in thrombin was used for closure in another case, with good results.

A pedicled pericranial graft is described by Ecker [30] for the repair of dural tears in the anterior fossa. The flap always seems to heal, despite exposure of parts of it to the nose and paranasal sinuses.

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26. Ecker, A.: Cerebrospinal Rhinorrhea by Way of the Eustachian Tube, J. Neurosurg. **4**:177-178 (March) 1947.

27. Haardt, W.: Cerebrospinal Fluid Fistula of the Internal Auditory Meatus with Spontaneous Pneumoencephalon, Monatsschr. f. Ohrenh. **81**:392-396 (July) 1947.

28. Cloward, R. B., and Cunningham, E. B.: The Use of Gelatin Sponge in Prevention and Treatment of Cerebrospinal Rhinorrhea, J. Neurosurg. **4**:519-525 (Nov.) 1947.

29. Love, G. J., and Gay, J. R.: Spontaneous Cerebrospinal Rhinorrhea: Successful Surgical Treatment, Arch. Otolaryng. **46**:40-44 (July) 1947.

30. Ecker, A. D.: Pedicled Pericranial Grafts for the Repair of Dural Tears in the Anterior Fossa of the Skull, Arch. Otolaryng. **45**:377-384 (April) 1947.

OTITIS MEDIA AND COMPLICATIONS

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THE LITERATURE on otitis media appearing in publications of 1947 is here reviewed under appropriate headings, for ease in comparisons. A number of very interesting articles appeared during this year, many of them deserving careful study in the original. Some articles are commented on under more than one heading. Editorial comments appear in brackets.

CHEMOTHERAPY AND BIOTHERAPY

Siirala [1] continues his excellent experimental work and reports the results on experimental infections of the inner ear of guinea pigs. Virulent hemolytic streptococci were introduced directly into the cochlea in 18 guinea pigs. Alternate animals were given a sulfonamide (prontosil®) and the others used as controls. Animals were killed at short intervals and careful histologic sections made of the temporal bones. [Excellent illustrations accompany the article.] Study of the sections showed that the sulfonamide checked the spread of infection, especially at natural obstructions and narrow spaces.

Streptomycin was used in 37 cases by Pulaski and Matthews.[2] In treating chronic otitis media, they used a solution of streptomycin containing 5,000 units per cubic centimeter. The clean, swabbed-out canal was flooded with the solution two to four times daily. In 10 cases the infections cleared up, and in only 1 case was there no improvement. The failure is unexplained, since the organisms in this case were sensitive to streptomycin in vitro. One patient with acute mastoiditis was doing badly after operation in spite of penicillin. A sensitivity test showed the organism sensitive to streptomycin but not to penicillin. Penicillin was stopped and streptomycin started. Improvement was immediate. The temperature, which had been spiking to 105 F., came down. However, after eleven days it was necessary to do a second operation for lateral sinus thrombosis. The patient recovered.

1. Siirala, U.: The Influence of Sulfonamides on Infectious Otitis Interna: Experiments with Guinea Pigs, Acta oto-laryng. **35**:77-90, 1947.

2. Pulaski, E. J., and Matthews, C. S.: Streptomycin in Surgical Infections, Arch. Otolaryng. **45**:503-515 (May) 1947.

Eight patients with brain abscess were treated, with 1 death; and 12 with meningitis were treated, with 3 deaths. These will be commented on under other headings. The average dosage was 0.25 Gm. of streptomycin every three or four hours. The intrathecal dosage was 0.1 to 0.5 Gm. daily or every twelve hours.

Karatay [3] reported on the treatment of 26 patients with otitis media seen on Dr. Kiernan's service of Columbia University College of Physicians and Surgeons. Penicillin was given intramuscularly in doses averaging 20,000 units every three hours. Five patients required mastoidectomy. One patient with otitis media of one month's duration was treated by penicillin drops without result, but the infection cleared up in three days after administration of streptomycin drops. Karatay expresses the opinion that in certain cases which clear up without operation after long-continued use of penicillin there may be formed enough granulation tissue, with resulting adhesions, to produce conduction deafness.

Lüscher and Iselin [4] reviewed 606 cases of otitis media in patients admitted to the clinic of the University of Basel in the years 1937 to 1940. Another series, of 505 cases, seen after the introduction of sulfonamides, 1941 to 1944, was compared. There were 32 per cent fewer surgical operations necessary, chiefly mastoidectomies. Intracranial complications were reduced from 10.5 to 4.2 per cent. On the basis of these figures, the authors advise administration of sulfonamides in all cases of severe otitis media.

Holt and Snell [5] used streptomycin in a series of 20 cases of suppurative otitis media. In 3 cases the condition was acute; in 1 it had followed traumatic rupture. In the 20 patients, 26 ears were infected and cultures showed gram-negative organisms. The routine treatment was 2 Gm. of streptomycin daily for five days divided into twelve doses, every two hours, day and night. Ears were dried daily and streptomycin solution (1 Gm. in 12 cc.) was instilled hourly throughout waking hours. All patients showed improvement, and 6 ears dried within five days. Complete drying occurred in 50 per cent of the infected ears. Improvement was noted in 31 per cent; nineteen per cent showed no improvement. The only untoward reaction noted was swelling of the face and lips in 1 patient. The condition cleared up in one day when tripelennamine hydrochloride (benadryl®), four doses of 50 mg. each,

3. Karatay, S.: Treatment of Otitis Media and Sinusitis with Penicillin, Arch. Otolaryng. **45**:288-293 (March) 1947.

4. Lüscher, E., and Iselin, H.: Efficacy of Sulfonamides in Prophylaxis and Treatment of Severe Acute Inflammation of Middle Ear, of Mastoiditis and of Intracranial Complications, Schweiz. med. Wchnschr. **77**:133-139 (Jan. 25) 1947.

5. Holt, J. B., and Snell, F. B.: Streptomycin Used in the Treatment of Suppurative Otitis Media, Arch. Otolaryng. **45**:169-172 (Feb.) 1947.

was given. The patient gave a history of having had angioneurotic edema in the past.

Preber [6] describes the pathology of chronic arachnoiditis which may result from the chronic irritation of a chronic otitis media. He quotes extensively from the neurosurgical literature. Cysts or adhesions may form, which may give pressure symptoms resembling acoustic nerve tumors. These symptoms are: impairment of hearing, tinnitus, decreased caloric excitability, past pointing, ache in the mastoid area, dizziness, vomiting and, rarely, choked disk. He presents 3 cases, in 1 of which there was clearing after operative opening of a cystlike cavity in the cerebellopontile angle. The cyst contained 10 or 12 cc. of clear fluid. Such adhesions and cysts are missed at necropsy when the brain is taken from the cranial cavity in the usual manner, especially the lesions around the exit points of nerves. Preber concludes that "it is of importance to bear in mind that an infection, trauma or inflammatory process in the middle ear and petrous bone may cause a cisternal arachnoiditis in the cerebellopontile angle that may give rise to differential diagnostic difficulties and simulate abscess or tumor in fossa cranii posterior. [This condition is well known to the neurologists and should be kept in mind by otologists.]

Welin [7] made roentgenograms in 30 cases of chronic otitis media after injection of iodized oil (lipiodol®) into the eustachian tube. The contrast medium was injected through perforations in the drum membrane in most cases. [Exact technic was not given, but apparently the solution was dropped into the canal and alternate suction and pressure applied as in a Proetz treatment.] In a few cases the oil was injected through the eustachian tube by eustachian catheter. In these cases the middle ear did not fill well. In 22 cases the contrast medium went into the mastoid antrum, and occasionally it went well into the mastoid cells. In several cases peritubal air cells filled and were shown nicely in the reproductions. In 1 case the cells starting around the tube continued in toward the petrous pyramid. In 10 cases abnormalities were found in the eustachian tube; 2 strictures were shown, and 1 polyp-like defect showed nicely. [An interesting study with good illustrations, this article offers confirmation of the idea that medicaments may reach greater depths than had been previously supposed. It is probably necessary that these deep cells be filled with air and not pus. This supposition might easily be checked by further study, using iodized oil in the presence of acute and chronic infection.]

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6. Preber, L.: Arachnoiditis in Fossa Cranii Posterior of Otological Interest, Acta oto-laryng. **35**:271-290, 1947.

7. Welin, S.: On the Radiological Examination of the Eustachian Tube in Cases of Chronic Otitis, Acta radiol. **28**:95-103, 1947.

PREVENTION OF OTITIS MEDIA

Taylor [8] compares the complications of scarlet fever in the years 1923 to 1925 with those in 1946. In 1946, routine scarlet fever antitoxin was given to all patients classified as moderately or severely ill. The incidence of acute otitis media was brought down from 6 to 1.8 per cent and the incidence of mastoiditis from 2.4 to 0.8 per cent. [The exact number of patients is not given. Epidemics vary in their intensity, and the figures would be of more value if there had been better controls.]

ACUTE OTITIS MEDIA AND MASTOIDITIS

Vaheri [9] published a very complete analysis of the cases of 2,606 patients with scarlet fever treated at a Helsinki hospital during the years 1940 to 1944. Purulent otitis media developed in 528, a frequency of 20.3 per cent. He found that most of the patients in whom otitis media developed had previously had rhinitis, and so considered the rhinitis a cause of the otitis. The relative frequency of otitis media was greatest in patients under 5 years of age. Necrotic otitis media with destruction of the drum occurred in 1.3 per cent of patients; mastoiditis in 9.3 per cent. Among the 528 patients with otitis there were 3 deaths, a mortality rate of 0.6 per cent. One fatality came from cerebellar abscess, 1 from streptococcic meningitis and 1 from sinus thrombosis. A definite impairment of hearing was found in 9.3 per cent of the 192 patients examined later on follow-up investigation. Severe deafness occurred in 21 ears in 17 patients. A distinct caloric reaction was found in 6 of the deaf ears; the other 15 did not react. Labyrinthitis was rather common in the chronic phase. The labyrinthine symptoms were slight and occurred rarely. They sometimes came on a long time after the acute infection had subsided. [A carefully analyzed investigation.]

Cobb [10] outlines for the general physician the anatomic types of mastoids and explains the symptoms, diagnosis and treatment of acute and chronic mastoiditis. This article, with three others in the same English journal, comprise an excellent symposium on the ear for the general practitioner. The other three articles are on otosclerosis,[11] chronic otitis media [12] and otitis externa.[13]

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8. Taylor, E. F.: Acute Otitis Media in Scarlet Fever, Manitoba M. Rev. **27**:637-638 (Nov.) 1947.

9. Vaheri, E.: Acute and Chronic Scarlatina Otitis, Acta oto-laryng. **35**:46-76, 1947.

10. Cobb, J. H.: Infections of the Mastoid, Practitioner **158**:102-108 (Feb.) 1947.

11. Cawthorne: Otosclerosis, Practitioner **158**:109-114 (Feb.) 1947.

12. Hall, I. S.: Chronic Otitis Media, Practitioner **158**:97-101 (Feb.) 1947.

13. Ashcroft, D. W.: Otitis Externa, Practitioner **158**:115-120 (Feb.) 1947.

CHRONIC OTITIS MEDIA AND MASTOIDITIS

Hall's article,[12] previously mentioned, gives a complete and clear outline for the general practitioner on chronic otitis media, with tests and directions for care. He properly advises that general chemotherapy has little place in the management of chronic otitis media.

Maxwell [14] describes the type of chronic otitis that is amenable to the modified radical mastoidectomy and gives preoperative and postoperative audiograms of 7 patients who underwent the Lempert type of modified radical operation. The postoperative audiogram is in no case much worse than the preoperative record and in 1 case is decidedly better. Maxwell pleads for individualized management of each case and for treatment or operation to deal adequately with the infection and conserve hearing as much as possible.

Unger [15] recommends deep lavage in management of chronic otitis media, with use of a motor-driven machine to give alternate pressure and suction. He considers 1 per cent hydrogen peroxide as the medicament of choice. In 9 of 15 patients there was clearing of the infection; the other 6 discontinued treatment. Polypi present in several patients disappeared spontaneously after the discharge stopped, and in a few instances small perforations healed. If the healing of the perforations did not proceed properly, Unger applied ointment of scarlet red N. F. and covered the perforations with gold foil. All the perforations healed eventually. The duration of the discharge before treatment varied from seven to forty-six years. Diagrams of the size of the perforations are given. [I believe that this pressure system might be very dangerous. What might happen if the dura were exposed and covered with granulations and were necrotic?]

Hayes and Hall [16] studied 28 cases of chronic otitis media and 71 cases of otitis externa, doing most of the work while they were in the Army. They report that in a very high percentage of cases of chronic otitis media of six weeks' duration or more cultures yielded gram-negative organisms, especially Pseudomonas aeruginosa (Bacillus pyocyaneus). Much bacteriologic work was done in these cases. Nine tables are given classifying the cases. The authors used dibromo-

14. Maxwell, J. H.: Consideration of Hearing Impairment in the Treatment of Chronic Suppurative Otitis Media, Surg., Gynec. & Obst. **84**:845-849 (April 15) 1947.

15. Unger, M.: A Different Treatment of Chronic Purulent Otitis Media, Arch. Otolaryng. **46**:670-680 (Nov.) 1947.

16. Hayes, M. B., and Hall, C. F.: The Management of Otogenic Infection, Tr. Am. Acad. Ophth. **51**:149-163 (Jan.-Feb.) 1947.

salicylaldehyde in powder, ointment and solution form and reported excellent results. At the time the study was made streptomycin was not available.

Cullom [17] cites the literature to show the frequency and importance of chronic otitis media. Probably 2 per cent of the population of the United States is affected. He repeats that infected ears are (1) a menace to life because of possible extension of the infection to the meninges, the brain and elsewhere; (2) a frequent cause of deafness; (3) a constant annoyance, and (4) an economic handicap. Citations from foreign authors indicate a higher incidence abroad than in our country. For many years Cullom has been noting and lecturing on the frequent association of chronic sinusitis and chronic otitis media. He reports 5 cases of chronic otitis media with spontaneous healing after performance of Caldwell-Luc operations for chronic suppurative maxillary sinusitis. [I believe that in all cases of chronic otitis pathologic conditions in the nose and throat should be corrected as a preliminary to treatment of the ear.]

Lodge [18] reports on 100 cases of chronic otitis media in which operation was done by way of endaural route. There was one death "from a concomitant precerebellar cyst." Complete healing was obtained in 78 of the 100 cases. Several color plates depicting the pathologic appearance in chronic mastoiditis are shown. Lodge uses the Lempert type of flap for modified radical operations.

MASKING

Barrett [19] reviews the pathology of mastoiditis and reports 2 cases of thrombosis of the lateral sinus developing while penicillin therapy was in progress. In neither case did the drug control the disease until the sinus was opened and the thrombus removed. The typical spiking temperature was not present, the symptoms being masked. When complications arise, surgical intervention is usually necessary, in addition to penicillin. The author concludes that "indiscreet, inadequate and unwise administration of the drug is responsible for most failures of penicillin in the treatment of mastoiditis." [This article emphasizes the fact that whereas penicillin will not remove pus or a thrombus, surgical procedures may do so.]

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17. Cullom, M. M.: Chronic Purulent Otitis Media, Arch. Otolaryng. **46**: 137-152 (Aug.) 1947.

18. Lodge, W. O.: Operative Treatment of Chronic Otitis Media, J. Internat. Coll. Surgeons **10**:197-207 (March-April) 1947.

19. Barrett, J. H.: Acute Mastoiditis Masked by Penicillin Therapy, Ann. Otol., Rhin. & Laryng. **56**:134-140 (March) 1947.

Lindsay [20] points out that the objections to the use of sulfonamide preparations on the grounds of masking of symptoms have now been mostly removed by the introduction of penicillin, large doses of which may be given without danger of toxicity at the beginning of treatment. He also comments on the futility of using penicillin drops in acute otitis media.

BACTERIOLOGY

Ghiselin and Robertson [21] report a case of otogenous meningitis caused by Friedländer's bacillus, the second reported case with recovery. Fourteen cases were found in a search of the literature. The clinical picture in otitis media due to Friedländer's bacillus is insidious, resembling the course of infections caused by the type III pneumococcus. Ordinarily this organism is associated with extensive spreading suppurations of the body. It is not rare to find it in septicemias, hepatic abscesses and meningitides, as well as in the upper and lower respiratory tracts. It is frequently found in the infections occurring in diabetes. It occurs in less than 1 per cent of the reported series of cases of otitis media, in many of which large numbers of cultures have been made. The authors quote Profant: "What may be considered a mild otitis media can suddenly develop serious complications." A résumé of all 13 previously reported cases of meningitis from Friedländer's bacillus was given.

The authors' patient was a Negro man of 48 who had diabetes. Meningitis developed three and a half months after the onset of acute otitis media. Friedländer's bacillus was found in the spinal fluid. Mastoidectomy showed extensive destruction and epidural abscess. Penicillin and sulfadiazine were given in large doses. It is doubtful that recovery was due to the penicillin, since later tests showed the organism not sensitive to penicillin. The organism however, was very sensitive to streptomycin. Ghiselin and Robertson conclude that streptomycin may prove effective against this organism in the future and that the most important theraputic treatment is an early extensive mastoidectomy. [This is a carefully prepared report.]

LATERAL SINUS THROMBOSIS

Druss [22] reports the case of a woman 61 years old who died of sepsis; the colon bacillus was recovered from the blood. She was studied in two hospitals for weeks for fever of unknown origin without diagnosis

20. Lindsay, J. R.: Chemotherapy in Infections of the Ears and Paranasal Sinuses, Bull. Vancouver M. A. **23**:35-39 (Nov.) 1946.

21. Ghiselin, A. D., and Robertson, R. B.: Friedlaender's Bacillus Meningitis Secondary to Otitis Media: Report of Case with Recovery and Review of Literature, Arch. Otolaryng. **45**:432-445 (April) 1947.

22. Druss, J. G.: Otitic Sepsis Due to Colon Bacillus, Arch. Otolaryng. **45**: 687-692 (June) 1947.

of the thrombosis of the lateral sinus that caused her death. An ear had discharged for five years, but repeated examinations had not shown enough significant data to make the examiners suspicious. Symptoms had continued for more than ten months without establishment of a diagnosis. The thrombosis had advanced by retrograde extension beyond the torcular Herophili and produced an abscess of the parietal lobe on the opposite side with meningitis, of which the patient finally died. Cholesteatoma had also invaded the labyrinth and petrous pyramid, but clinical symptoms of labyrinthitis had not been noted. There are two illustrations showing histologic sections of the cholesteatoma with erosion into the posterior semicircular canal and the vestibule. Druss adds that sulfamerazine and streptomycin have since proved efficacious in treating infections due to some strains of the colon bacillus and that "early removal of a focus of infection is still the method of choice." [This further emphasizes the necessity for careful watch of chronic cases and for repeated roentgenograms which frequently show advance of the pathologic process.]

MENINGITIS

Mitchell [23] reports on 7 cases of meningitis seen while he was in the naval service at San Diego Naval Hospital, 5 of otitic origin and 2 from infections in the nasal sinuses. Of the 4 brain abscesses, 3 were due to otitis.

In 1 patient meningitis developed forty-eight hours after onset of otitis media. He was cured with sulfadiazine and penicillin and did not have mastoidectomy. The other 4 patients with otitis had mastoidectomy after meningitis was controlled by penicillin and sulfadiazine. [It is generally accepted that meningitis occurring in the first few days of otitis media is probably of thrombophlebitic origin and not from direct necrosis. Therefore mastoidectomy is not indicated in the early cases.]

Pulaski and Matthews [2] (mentioned under chemotherapy) treated 11 meningitic patients; 3 were treated with streptomycin alone, 1 with streptomycin and penicillin, 5 with streptomycin, penicillin and sulfadiazine, 1 with streptomycin and sulfadiazine and 1 with streptomycin, sulfatoidectomy had been done six months before. Increasingly severe headdiazine and Hemophilus influenzae serum. Three patients died; 1 was moribund on admission; 1 had an infection due to Cryptococcus hominis, which is known to be refractory to streptomycin, and the third died despite prompt and adequate therapy. The infective organism was H. influenzae, and H. influenzae serum was given in addition

23. Mitchell, G.: Clinical Experiences with Intracranial Complications of Ear and Sinus Diseases, Texas State J. Med. **43**:25-28 (May) 1947.

to streptomycin and sulfadiazine. Several of these patients had received penicillin before streptomycin therapy was instituted, without improvement.

LABYRINTHITIS

Weille [24] reports in detail the case of a boy of 12 years who was admitted to the hospital with a diagnosis of chronic otitis media of two years' duration, and facial paralysis of two weeks' duration. Treatment required five months and three operative procedures. The discussion of the progress of the case is most instructive and should be studied in the original article by all otologists. Weille states that this is one of the most interesting otologic cases encountered in nearly two decades of service at the Massachusetts Eye and Ear Infirmary. The roentgenogram on admission showed destruction of the cochlear region and of the horizontal semicircular canal. Symptoms of labyrinthitis were present. A radical mastoidectomy was done without disturbance of the granulations over the labyrinth and facial nerve. The facial paralysis cleared in about nineteen days. Three weeks after the radical mastoidectomy, swelling of the eye on the affected side developed. Roentgenograms showed a defect in the roof of the petrous bone. A week later exploration of the left labyrinth was done, and the entire remnants of the horizontal and superior semicircular canals were removed. The petrous pyramid was not explored. The patient was much better for a week; then cavernous sinus thrombosis developed. Heparin was given and, later, dicumarol.® There was recovery from the cavernous sinus thrombosis, and then symptoms of meningitis arose. A third operation was done, at which the petrous pyramid was explored and remnants of the labyrinth removed. Recovery after this procedure was uneventful.

Hlaváček [25] reports 12 cases of labyrinthitis, 7 occurring during acute otitis media and 5 due to chronic otitis media. Frequent lumbar puncture was performed, as often as five times daily. Sulfonamides were given by mouth, intramuscularly and, in 1 case, into the spinal canal. In labyrinthitis complicating acute otitis, cure without operation on the labyrinth was obtained in all but 1 case. However, in chronic otitis the labyrinthitis was not controlled by sulfonamides, and opening of the inner ear was necessary in each case. The chief indication for opening the inner ear was increase in the number of cells in the spinal fluid. There were no deaths in the series. Spinal taps were sometimes done several times a day for determining increase or decrease

24. Weille, F. L.: Superior Petrosal and Cavernous Sinus Thrombosis and Basal Petrositis, Arch. Otolaryng. **45**:90-104 (Jan.) 1947.

25. Hlaváček, V.: The Influence of Sulfonamides on Labyrinthitis and on Indications for Operative Interventions in the Inner Ear, Acta oto-laryng. **35**:258-270, 1947.

of the number of cells present. [This is an instructive paper and deserves study in the original. The stated dosage suggests that the sulfonamide levels may have been inadequate; blood and spinal fluid levels were apparently not used as controls. Antibiotics have further influenced the indication for labyrinthectomy.]

ENCEPHALITIS

Piquet [26] reports 2 cases of nonsuppurative encephalitis of otogenic origin and 1 starting from a frontal sinus. The differential diagnosis of the different types of encephalitis and treatment are outlined. The author advises immediate removal of the focus of infection and chemotherapy. One case was that of a child of 4 who had just recovered from scarlet fever. The second was that of a woman of 58 in whom otitis media developed during influenza. Both patients recovered.

Richtner [27] regards nonsuppurative encephalitis as a fairly common complication of otitis. He does not consider that it is a "stage of brain abscess," as held by some, any more than pneumonia is a stage of pulmonary abscess. He analyzes 32 cases reported in the literature, and reports 2 cases of his own. In the cases discussed there were 4 deaths, but in 2 of the patients who died there were also thrombosis of the sigmoid and longitudinal sinuses.

BRAIN ABSCESS

Jongkees [28] reviews the different methods of treating brain abscess and reports 2 cases. One patient was a youth of 18, who had had a chronic draining ear since early childhood. After the removal of a polyp, the boy became mentally abnormal and aphasia developed. Radical mastoidectomy was done, and the temporal lobe was punctured and the abscess found. About 2 cc. of pus was aspirated and 2 cc. of penicillin solution containing 20,000 units was injected. The patient recovered rapidly without further aspiration. The second case was that of a man of 21 who had had chronic otitis media for thirteen years. A radical mastoidectomy had been done six months before. Increasingly severe headache and cerebellar symptoms developed without signs of meningitis. This patient also recovered with only one puncture and aspiration of the cerebellar abscess, with replacement of an equal quantity of penicillin solution (5 cc. containing 50,000 units.) In neither case was spinal tap performed, since there was no doubt of the diagnosis and it was feared

26. Piquet, J.: L'encéphalite aiguë non suppurée d'origine auriculaire ou nasale, Acta oto-laryng. **35**:211-219, 1947.

27. Richtner, N. G.: On Encephalitis Otogenica Localisata Non Suppurativa, Acta oto-laryng. **35**:156-179, 1947.

28. Jongkees, L. B. W.: Otogenic Brain Abscess, Acta oto-laryng. **35**:225-230, 1947.

that cerebellar pressure might occur. Jongkees states that he has not feared to remove a small amount of cerebrospinal fluid in similar cases and has had no bad results.

Waltner [29] reports the unusual case of a 54 year old woman in whom an abscess of the frontal lobe developed on the side opposite to the infected ear. Symptoms of paralysis of the opposite arm and leg developed on the twelfth day of an otitis media. At this time the patient was seen in consultation by Dr. John D. Kiernan, who suggested postponement of mastoidectomy if cultures of the spinal fluid remained sterile. Simple mastoidectomy was done on the thirtieth day of the infection, burrs being used to prevent jarring the skull. Brain abscess was diagnosed and located by pneumoencephalogram. The abscess was drained and penicillin solution injected into the cavity. Recovery was complete.

Search of the literature disclosed only 10 cases with localization of the brain abscess on the contralateral side, the present case being the third reported case with recovery. Waltner accepts Courville's explanation of the localization of the infection on the side opposite to the infection: retrograde venous spread following primary thrombophlebitis of the sigmoid sinus. In this case extensive phlebitis, if not thrombosis, was found in the lower half of the sigmoid sinus, and a thrombosed vessel was found over the area of the brain which lay just above the abscess.

FACIAL PARALYSIS

Gooch and Simonton [30] discuss the diagnosis of complications of chronic suppurative otitis media and present a case. An adequate history generally provides more information than is obtained from all other sources. The case reported was that of a woman of 47 years who had had a draining right ear since an attack of scarlet fever at 4 years of age. There were headache and vomiting but very little drainage and no foul odor. The sudden development of facial paralysis made the diagnosis of cholesteatoma obvious. The patient had been observed by an otologist for years, but the extent of the pathologic change was not suspected. Operation revealed cholesteatoma, epidural abscess and labyrinthitis. Examination before operation had shown only a tiny perforation in Shrapnell's membrane. [This case again shows the necessity of careful watch and repeated roentgenograms, which may show a cholesteatoma; in such cases the patient is much safer after operation is done.]

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29. Waltner, J. G.: Otogenic Abscess of the Contralateral Frontal Lobe, Arch. Otolaryng. **46**:375-381 (Sept.) 1947.

30. Gooch, J. O., and Simonton, K. M.: Diagnosis of Complications of Chronic Suppurative Otitis Media, Proc. Staff Meet., Mayo Clin. **22**:519-524 (Nov. 12) 1947.

TECHNIC

Lodge [31] reports 100 cases of mastoidectomy for chronic mastoiditis with only 1 death, due to a precerebellar cyst. Healing was complete, with dry cavities, in 78 cases. Illustrations include six colored plates of pathologic middle ears. Lodge uses the endaural route except when there is excessive pneumatization; when this condition is shown by preliminary roentgenograms, he prefers the postaural incision.

Morrison [32] lists thirteen advantages of the endaural over the postaural route in chronic mastoiditis. The chief advantage of the newer approach is better vision obtained in the middle ear area. This allows a more careful inspection of the ossicles when deciding between the modified and the complete radical operation, and consequently hearing may be preserved in some cases. The flap for the modified radical procedure is the same as that used in the fenestration operation. The steps in the operation are described and illustrated. [Persons not yet familiar with the endaural technic may well study this article.]

MISCELLANEOUS

Lillie and McBean [33] report 2 cases of chronic mastoiditis with extensive cholesteatoma formation. There was resulting stenosis of the external auditory canal in both cases. In both cases there was complete clearing after radical mastoidectomy by way of the endaural approach.

Lillie and Spar [34] reviewed the literature and found 22 cases in which escape of cerebrospinal fluid occurred spontaneously at or after operation on the temporal bone. They report 4 more cases and state that although meningitis would naturally be expected it has not often occurred. They advise that when a cerebrospinal otorrhoea persists longer than three weeks, an attempt should be made to close the defect. Approximation of the torn edges with silk is advised. If this is not possible, soluble cellucotton® can be packed against the injured region. Repair of persistent defects was successfully done in 4 cases.

[While I was interning, I saw an accidental rupture of the dura during a simple mastoidectomy. The flow of cerebrospinal fluid was

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31. Lodge, W. O.: Operative Treatment of Chronic Otitis Media, J. Internat. Coll. Surgeons **10**:197-207 (March-April) 1947.

32. Morrison, W. W.: Endaural Surgery for Chronic Mastoiditis, Arch. Otolaryng. **46**:317-327 (June) 1947.

33. Lillie, H. I., and McBean, J. B.: Chronic Mastoiditis with Cholesteatoma and Stenosis of the External Auditory Meatus, Minnesota Med. **30**:161-165 (Feb.) 1947.

34. Lillie, H. I., and Spar, A. A.: Escape of Cerebrospinal Fluid into the Wounds of Operations on the Temporal Bone, Arch. Otolaryng. **46**:779-789 (Dec.) 1947.

profuse for several days. Although the infecting organism was an apparently very virulent hemolytic streptococcus and chemotherapy was not then available, the patient recovered uneventfully.]

ALLERGIC OTITIS

Koch [35] investigated the cell contents of the discharges from the ear canals of 222 patients with chronic otitis. In about one third of the smears there were eosinophils, varying from 9 to 40 per cent. Investigation showed these patients to have personal and family histories of allergy. In the "allergic ears," the mucus was usually clear and tenacious. The mucous membrane of the middle ears in these patients appeared edematous. Treatment is directed toward the underlying allergy. [This is a most interesting article; the findings should be confirmed by examination of similar cases.]

35. Koch, H.: Allergical Investigations of Chronic Otitis, Acta oto-laryng., 1947, supp. 62, pp. 1-201.

TUMORS OF THE NOSE AND THROAT

Review of the Literature

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TUMORS OF THE NOSE

GRACE [1] reports the case of a Negro who had a malignant melanoma of the nose. Malignant melanoma of the nasal mucous membrane occurs rarely and is unique in that it develops in a site where the tissues normally do not contain pigment. The pathologic and etiologic aspects of the disease are discussed, and the author presents the views of various authors in regard to the nature of the tumor and the site of its occurrence. A discussion of the symptoms, diagnosis, treatment and prognosis is also included.

Lewy [2] reports a case in which a Negro had a melanoma which originated on the nasal septum. This was treated with electrocautery.

Imler and Underwood [3] also reported a similar case. They cited Ringertz,[4] who stated in 1938 that about 50 cases of malignant melanoma of the nasal and paranasal regions had been reported. The tumor in the nose often grows rather slowly and metastasizes late. The symptoms are mainly those of mechanical obstruction and bleeding.

Shea [5] stated that the impression is prevalent that all nasal polyps are allergic in origin. He thinks that this is an exaggeration and reported several cases to show the different pathologic entities that may be encountered in so-called nasal polyps. He presented, among others, cases of intranasal lymphangioma, hemangioma, plasmocytoma

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From the Section on Laryngology, Oral and Plastic Surgery, Mayo Clinic.

1. Grace, C. C.: Malignant Melanoma of the Nasal Mucosa, Arch. Otolaryng. **46**:195-210 (Aug.) 1947.

2. Lewy, A.: Nasal Melanoma, Ann. Otol., Rhin. & Laryng. **56**:493-494 (June) 1947.

3. Imler, A. E., and Underwood, J. W.: Malignant Melanoma in the Negro, South. Surgeon **13**:61-71 (Feb.) 1947.

4. Ringer, N., cited by Imler and Underwood.[3]

5. Shea, J. J.: The Pathology of Nasal Polyps and Related Growths, Ann. Otol., Rhin. & Laryng. **56**:1029-1034 (Dec.) 1947.

and transitional cell carcinoma. The majority of nasal polyps are allergic and simple, but, because a sufficient number of growths are serious, thorough microscopic study of all polyps removed is justified.

Simpson, McArthur and Atkinson [6] present a classification of tumors of the superior maxilla which they have treated. There is a brief description of the pertinent pathologic features of each type. The symptomatology, surgical approach and technic used in the management of these tumors are outlined.

Heatly [7] discusses adamantinoma and presents cases in which the tumor originated in the maxillary sinus. The adamantinoma arises from paradental epithelial rests, which may remain around the roots of the teeth even late in life. Two types are recognized: the solid and the cystic, the latter being commoner. Its relentless growth and persistent recurrence if it is not removed completely indicate that for clinical purposes it should be regarded as a malignant growth. It occurs most commonly in the third decade of life and five times as frequently in the mandible as in the maxilla. Complete and radical removal by electrocoagulation is necessary. Conservative measures seldom prove successful, and postoperative irradiation is of little value.

Munson and Munson [8] present a case of adenocarcinoma, grade 3, of the ethmoid sinus. Cancer in the labyrinth of the ethmoid bone is usually bad news to the otolaryngologist. Since the cancer often spreads quickly, the exact point of origin cannot always be determined. Common tumors of the labyrinth of the ethmoid bone include fibroma, osteoma, meningioma, ganglioneuroma and carcinoma. The carcinomas are of three main types: (1) the squamous cell, (2) the cylindrical cell (adenocarcinoma) and (3) the various intermediate and undifferentiated types. Adenocarcinoma is distinctly uncommon in the nasal cavity and the nasal accessory sinuses. The authors concluded that a Caldwell-Luc operation combined with a nasal approach is not adequate for a radical evisceration of the labyrinth of the ethmoid bone. Electrosurgery by means of an external approach is recommended for localized adenocarcinoma of the ethmoid sinus.

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6. Simpson, W. L.; McArthur, R. H., and Atkinson, R. H.: Management of Tumors of the Superior Maxilla and Adjacent Structures, South. Surgeon **13**:526-545 (Aug.) 1947.

7. Heatly, C. A.: Adamantinoma of the Maxillary Sinus, Arch Otolaryng. **45**:141-142 (Jan.) 1947.

8. Munson, F. T., and Munson, H. T. E.: Adenocarcinoma of the Ethmoid Sinus, Arch. Otolaryng. **45**:581-584 (May) 1947.

Anderson [9] describes a case in which a sphenopharyngeal encephalocele passed through the cribriform plate of the ethmoid bone and presented itself in the nasal cavity. Intranasal encephalocele is probably commoner than is generally believed. Since the protrusion resembles a polyp and nasal fibroma, the possibility of encephalocele should be considered when a spherical mass is observed in the nose or the nasopharynx, particularly in an infant or a child.

A case of dermoid cyst of the nasal bridge is reported by Ellis,[10] and Hubert,[11] Blassingame [12] and New,[13] in separate papers, discuss congenital cysts and fistulas about the head and neck.

New and Devine [14] discuss the symptoms, pathology and treatment of the various neurogenic tumors that one might encounter about the nose and throat. The tumors are divided into two large groups: developmental errors and neoplasms.

TUMORS OF THE NASOPHARYNX

Godtfredsen [15] collected 454 cases of carcinoma and sarcoma of the nasopharynx from four Scandinavian clinics. Reports of more than 2,000 cases of malignant nasopharyngeal tumors have been published. Among the patients, there were twice as many men as women. Fifty per cent of the tumors occurred between the ages of 41 and 60. There were four well defined groups of symptoms. The first group included ophthalmoneurologic symptoms caused by infiltrative growth of the primary tumor or its metastasis to the base of the brain and adjacent regions; the second group included rhinologic symptoms; the third, otologic symptoms caused by growth into the eustachian tube, and the fourth, symptoms resulting from enlarged cervical nodes. The first symptom appeared on an average of eleven months before exact diagnosis

9. Anderson, F. M.: Intranasal (Sphenopharyngeal) Encephalocele: A Report of a Case with Intracranial Repair and a Review of the Subject, Arch. Otolaryng. **46**:644-654 (Nov.) 1947.

10. Ellis, B. E.: Congenital Cysts of the Nasal Bridge, Ann. Otol., Rhin. & Laryng. **56**:211-215 (March) 1947.

11. Hubert, L.: Thyroglossal Cysts and Sinuses: Analysis of Forty-Three Cases, Arch. Otolaryng. **45**:105-111 (Jan.) 1947.

12. Blassingame, C. D.: Congenital Cysts and Fistulae About the Head and Neck, Ann. Otol., Rhin. & Laryng. **56**:395-403 (June) 1947.

13. New, G. B.: Congenital Cysts of the Tongue, the Floor of the Mouth, the Pharynx and the Larynx, Arch. Otolaryng. **45**:145-158 (Feb.) 1947.

14. New, G. B., and Devine, K. D.: Neurogenic Tumors of Nose and Throat, Arch. Otolaryng. **46**:163-179 (Aug.) 1947.

15. Godtfredsen, E.: Ophthalmo-Neurological Symptoms in Malignant Nasopharyngeal Tumours, Proc. Roy. Soc. Med. **40**:131-135 (Jan.) 1947.

was made. Ophthalmoneurologic complaints appeared as the first symptom in 16 per cent of the cases. Metastasis to the nodes or rhinologic symptoms were present as the first symptom in a third of the cases. Otologic symptoms were rare, being present in a fifth of the cases as the first symptom. Two thirds of the patients did not complain of nasal symptoms. The treatment was radiologic. The "five year cure rate" for the total cases was 22.2 per cent.

In a second paper, Godtfredsen [16] illustrates the importance in cases of parotid tumors of considering the possibility of a secondary tumor, particularly metastasis to the glands from a primary nasopharyngeal tumor.

Hoover [17] states that for each case of malignant disease of the nasopharynx, 13,000 or more patients are seen. As many as 675 new cases may occur in the United States each year. Treatment by radiation produces marked improvement in practically all patients—that is, alleviation of symptoms and prolongation of life—and a small percentage of cures is obtained.

Davis,[18] in a discussion of tumors of the nasopharynx, notes that radiotherapy has no beneficial effect on nasopharyngeal fibroma.

Brown [19] reports 6 cases in which a nasopharyngeal fibroma was removed successfully through a transpalatine approach. Preliminary ligation of one or both external carotid arteries was frequently necessary for the control of hemorrhage. The growth was separated from the base of the skull and removed in toto. Extension to the nose was present in all cases.

Waltner [20] reports 2 cases of nasopharyngeal plasmocytoma to be added to the 13 cases already published. At an early stage of the disease neither the clinical appearance nor the histologic character of these tumors is a reliable indication as to the prognosis. Surgical removal followed by roentgen therapy is indicated in every case of nasopharyn-

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16. Godtfredsen, E.: Malignant Nasopharyngeal Tumours Manifesting Themselves as Parotid Tumours, Acta chir. Scandinav. **95**:205-214, 1947.

17. Hoover, W. B.: Malignant Growths of Nasopharynx with Particular Emphasis on Their Frequency, Symptomatology and Diagnosis, S. Clin. North America **27**:577-581 (June) 1947.

18. Davis, E. D. D.: The Diagnosis and Treatment of Tumours of the Nasopharynx, Proc. Roy. Soc. Med. **40**:135-137 (Jan.) 1947.

19. Brown, J. M.: The Surgical Treatment of Nasopharyngeal Fibroma, Arch. Otolaryng. **46**:561-562 (Oct.) 1947.

20. Waltner, J. G.: Plasma Cell Tumors of the Nasopharynx, Ann. Otol., Rhin. & Laryng. **56**:911-916 (Dec.) 1947.

geal plasmocytoma. Some pathologists claim that extramedullary and medullary plasmocytoma are simply parallel manifestations of the same disease, multiple myeloma.

TUMORS OF THE MIDDLE EAR AND MASTOID PORTION OF THE TEMPORAL BONE

The case of a cyst of the mastoid and petrous portions of the temporal bone reported by Waltner and Karatay [21] is the first to be recorded in the literature. Histologic studies separate this cyst from a large group of dermoid cysts located in this area. The pathogenesis of the cyst is considered to be a developmental anomaly which occurred during the process of pneumatization.

Grossman, Donnelly and Snitman [22] state that primary carcinoma of the middle ear and mastoid process is rare. In any case in which there is marked invasion of the temporal bone, with only a correspondingly minor degree of infiltration of the external auditory canal, it is their opinion that the lesion may be considered a true primary carcinoma of the middle ear and mastoid process. They present 6 cases which fall into this group. Long-standing otorrhea and aural pain are the commonest symptoms. Early and complete surgical intervention together with radium therapy seemed to be the keynote to successful treatment at the time the report was written.

Novak [23] presents a case of cylindroma of the middle ear. This rare tumor was treated by radical surgical procedure.

LeCompte, Sommers and Lathrop [24] present a case of tumor of the carotid body of the middle ear. The possible origin is considered. The authors suggest that other tumors of this type may be recorded in the literature under different names, such as hemangioendothelioma or myoblastoma.

Proctor and Lindsay [25] discuss the tumors of the petrous portion of the temporal bone. Cases of meningioma, sarcoma and metastatic

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21. Waltner, J. G., and Karatay, S.: Cysts of the Mastoid Bone, Arch. Otolaryng. **46**:398-404 (Sept.) 1947.

22. Grossman, A. A.; Donnelly, W. A., and Snitman, M. F.: Carcinoma of the Middle Ear and Mastoid Process, Ann. Otol., Rhin. & Laryng. **56**:709-721 (Sept.) 1947.

23. Novak, F. J., III: Salivary Gland Tumor of the Middle Ear and Paget's Disease (Osteitis Deformans) of the Skull, Arch. Otolaryng. **45**:477-482 (April) 1947.

24. LeCompte, P. M.; Sommers, S. C., and Lathrop, F. D.: Tumor of Carotid Body Type Arising in the Middle Ear, Arch. Path. **44**:78-81 (July) 1947.

25. Proctor, B., and Lindsay, J. R.: Tumors Involving the Petrous Pyramid of the Temporal Bone, Arch. Otolaryng. **46**:180-194 (Aug.) 1947.

tumor of the temporal bone are presented. The bone marrow of the petrosa is capable of filtering tumor cells from the blood stream and of becoming a secondary focus for a new growth.

TUMORS OF THE TONSIL AND PHARYNX

Walker and Schulz [26] present 90 unselected cases of cancer of the tonsil in which irradiation was used for treatment. The five year survival rate is 15 per cent and is comparable to, but has not surpassed, results generally reported. Evidence shows that the grade of the lesion did not prove to be of great prognostic significance, except that tumors of low grade were controlled with difficulty. Lymphoepitheliomas appeared to respond well, and they warranted a less guarded prognosis than other types of tonsillar cancer in this small group. As compared with treatment without radium, interstitial insertion of radium has not produced noticeable improvement in results. In the group studied supervoltage irradiation has produced a significant increase in the percentage of five-year survivals as compared with high voltage therapy.

Lymphosarcoma of the tonsils is not common and is exceptionally rare in children, according to Morwitz.[27] He presents the case of a 3 year old boy with lymphosarcoma of the tonsils which metastasized rapidly and caused death. Roentgen therapy was not effective in this case or in other cases which were reported. In all cases reported the patients were boys. Examination of the whole tonsil is essential to assure diagnosis.

Koop, Jordan and Horn [28] present 2 instances of neuroma in the pharynx. This makes a total of 11 such tumors recorded in the literature. They believe that even small neuromas should be removed surgically, since they may produce symptoms as they enlarge.

A case in which a chordoma occurred in the cervical region is reported by Imperatori.[29] The tumor was found to the right of the midline, extending from the level of the epiglottis downward. There was no bony involvement. The tumor was removed by sharp dissection under suspension laryngoscopy.

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26. Walker, J. H., and Schulz, M. D.: Carcinoma of the Tonsil: A Review of Treatment and Its Results in a Group of Ninety Cases, Radiology **49**:162-168 (Aug.) 1947.

27. Morwitz, S. M.: Lymphosarcoma of the Tonsil in a Three-Year-Old Child, Ann. Otol., Rhin. & Laryng. **56**:892-897 (Dec.) 1947.

28. Koop, C. E.; Jordan, H. E., and Horn, R. C., Jr.: Neurilemmoma of the Pharynx, Surg., Gynec. & Obst. **85**:641-645 (Nov.) 1947.

29. Imperatori, C. J.: Chordoma of the Cervical Region, Arch. Otolaryng. **46**:568-569 (Oct.) 1947.

TUMORS OF THE LARYNX

Walsh [30] suggests the following classification of cancer of the larynx:

I. Intrinsic: confined to the true vocal cord only

II. Endolaryngeal: involving structures within the laryngeal box—that is, the ventricles, ventricular bands, arytenoids and interarytenoid space, also those cancers of the vocal cord which have spread across the anterior commissure

- A. Without fixation of the vocal cord or arytenoid
- B. With fixation of the vocal cord or arytenoid
- C. Histologic grade

III. Subglottic

IV. Extrinsic or extralaryngeal

He expresses the opinion that, in general, endolaryngeal cancer is operable. Subglottic cancer may be operable; the extent of the cancer is best observed by roentgenograms. Extrinsic or extralaryngeal cancer is usually inoperable and is best treated with roentgen rays. The prognosis is not good.

New, Figi, Havens and Erich,[31] in a discussion of the methods and results of treatment of carcinoma of the larynx, emphasize teamwork and the coordination of all the facilities available at the Mayo Clinic. Four methods are used for treatment of carcinoma of the larynx. They are (1) thyrotomy, (2) laryngectomy, (3) removal or treatment of the local lesion under suspension laryngoscopy and (4) external irradiation. Of all patients who underwent operation and who could be traced, 73.5 per cent survived five years or more without recurrence of the growth. No one form of treatment is superior to the others. The type of growth, its activity, extent and location, and the age and general physical condition of the patient should be the factors which determine the type of treatment to be instituted in each case.

Negus [32] discusses 93 cases of intrinsic cancer of the larynx. He advocates laryngofissure for growths limited to the vocal cord and external irradiation for a unilateral cordal growth which extends onto the arytenoid cartilage or reaches the posterior commissure without fixation. He considers laryngectomy the procedure of choice for a diffuse growth that arises in a larynx affected by chronic hypertrophic

30. Walsh, T. E.: The Classification of Carcinoma of the Larynx, Laryngoscope **57**:414-418 (June) 1947.

31. New, G. B.; Figi, F. A.; Havens, F. Z., and Erich, J. B.: Carcinoma of the Larynx: Methods and Results of Treatment, Surg., Gynec. & Obst. **85**:623-629 (Nov.) 1947.

32. Negus, V. E.: Intrinsic Cancer of the Larynx: Review of a Series of Cases, Proc. Roy. Soc. Med. **40**:515-524 (July) 1947.

laryngitis or of an extensive subglottic carcinoma or growth that is widespread and accompanied with marked fixation of the cords.

Orton [33] reports five year cures in 27 per cent of 51 cases of extrinsic carcinoma of the larynx in which it was necessary to resort to surgical excision. The growths involved the epiglottis, the aryepiglottic folds, the pre-epiglottic space, the pyriform fossa and the postcricoid area. Treatment required extensive resection of the pharyngeal tissues as well as bilateral removal of the regional glands.

LeJeune,[34] with the use of suspension laryngoscopy, performed intralaryngeal excision and cautery in 39 cases of cancer of the larynx. This can be done if the growth is in the early stages of development, small, limited to one vocal cord and completely surrounded by normal cordal tissue. Its advantages are (1) simplicity, (2) no external incision, (3) preservation of the continuity of the thyroid cartilage, (4) better postoperative phonation, (5) shorter hospitalization and (6) good prognosis.

Jesberg [35] outlines his methods for the surgical treatment of carcinoma of the larynx, and Kemler [36] describes an operation called "bilateral thyrotomy" for carcinoma of the larynx, to take the place of simple laryngofissure and operation on the anterior commissure for carcinoma of the larynx.

Beatty [37] states his belief that at the time of the report operative procedures offered the best prognosis for cancer of the larynx if suitable patients were chosen. He states that time enough has not elapsed to prove the eventual cure by irradiation alone in cases of patients who were suitable for laryngofissure or laryngectomy, notwithstanding some present day claims. He says that he has seen too many failures in years gone by.

Garland [38] points out that the success of radiation depends on several factors. The less extensive the lesion the greater, in general, is the chance of cure. If the arytenoid cartilages have been invaded,

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33. Orton, H. B.: The Pathology and Surgery of Extrinsic Cancer of the Larynx, Arch. Otolaryng. **46**:563-564 (Oct.) 1947.

34. LeJeune, F. E.: Intralaryngeal Surgical Operation for Selected Cases of Laryngeal Cancer, Arch. Otolaryng. **45**:133-134 (Jan.) 1947.

35. Jesberg, S.: Surgical Treatment for Carcinoma of the Larynx, J. A. M. A. **134**:121-122 (May 10) 1947.

36. Kemler, J. I.: Bilateral Thyrotomy for Carcinoma of the Larynx, Laryngoscope **57**:704-718 (Nov.) 1947.

37. Beatty, H. G.: Cancer of the Larynx and Nasal Accessory Sinuses, Ohio State M. J. **43**:843-846 (Aug.) 1947.

38. Garland, L. H.: Radiation Therapy of Laryngeal Carcinoma, West. J. Surg. **55**:352-353 (June) 1947.

the chance of sterilization by radiation is greatly reduced. Tumors of the laryngeal vestibule are radiosensitive in the majority of cases. Lesions of the vocal cords are favorable for treatment. Most of the carcinomas in the vestibule and the ventricular cavity are composed of undifferentiated cells and are particularly radiosensitive. Lesions composed of more differentiated cells usually occur on the cords and in the subglottis, and, while these cells are more radioresistant than the undifferentiated cells, they are usually more radiocurable. The complications incident to intensive radiation include edema, cartilage necrosis, dyspnea and dysphagia. Hemorrhage is rare. Garland believes that, because of the better functional results and the good rate of cure, radiation is now accepted as the method of choice in the majority of cases of laryngeal carcinomas.

Lenz [39] recommends roentgen therapy for all cancer of the vocal cords except when the cancer has extended subglottically or into the arytenoid cartilages. In these cases he prefers to follow laryngectomy with roentgen therapy if, clinically, there is persistent cancer or if microscopic examination of the specimen removed at laryngectomy shows that the removal was incomplete. Roentgen therapy has been successful in a small number of cases of cordal cancer with definite fixation of the arytenoid cartilage but should be substituted for laryngectomy only if there are valid reasons for avoiding this operation.

Arbuckle [40] advocates laryngofissure for cancer of the true vocal cord and resection of the laryngeal cartilage followed by roentgen therapy for all other cancer of the larynx.

According to Blady,[41] cancer of the larynx which recurs after a laryngofissure can be successfully treated either by laryngectomy or by roentgen irradiation. He prefers laryngectomy to irradiation in the treatment of squamous cell carcinoma, grade 3. One course of irradiation which delivers a cancerocidal dose effective on tumors, or even a second similar course when used in selected cases, will not produce the undesirable complication of radionecrosis. Blady believes that in the event of recurrence after roentgen irradiation the lesion can be treated successfully by a second course of irradiation or by laryngectomy but that

39. Lenz, M.: Roentgen Therapy in Cancer of the Larynx, J. A. M. A. **134**:117-121 (May 10) 1947.

40. Arbuckle, M. F.: Treatment of Inoperable Cancer of the Larynx with X-Ray After Preliminary Surgical Removal of the Thyroid Cartilages with Improved Classification of the Larynx, South. M. J. **40**:462-465 (June) 1947.

41. Blady, J. V.: The Treatment of Recurrences and Evaluation of Criteria for the Selection of Treatment of Cancer of the Larynx, Am. J. Roentgenol. **58**:331-340 (Sept.) 1947.

recurrence after laryngectomy is a hopeless condition. Results of treatment of recurrent lesions after laryngofissure, laryngectomy and irradiation are presented and discussed.

Cases of laryngeal neurinoma, fibrosarcoma, chondroma and lymphosarcoma are reported respectively by Walker,[42] Lewy,[43] Rosedale [44] and Schlemenson and Caceres Graziani.[45] Orton [46] reports a case of squamous cell epithelioma of the larynx in a boy 13½ years of age, with metastasis to cervical nodes, bones and brain. Mills, Dominguez and McCall [47] review the literature and report a case in which squamous cell carcinoma and malignant lymphoma of the larynx occurred simultaneously.

Jackson [48] defines laryngocele as an anomalous air sac connected with the larynx. It is a condition very often overlooked. A true laryngocele is lined with mucous membrane. The symptoms may be hoarseness, dyspnea or external bulge or a hissing noise on pressure of the external bulge. Diagnosis is based on symptoms, laryngoscopic appearance, external appearance and planigraphic roentgenologic studies. Surgical excision is indicated for external laryngoceles. In many cases of internal laryngocele endoscopic removal of part of the wall of the sac is indicated.

McLaurin [49] also reports a case of laryngocele and reviews the literature.

TUMORS OF THE TRACHEA

Fisher [50] notes a very definite increase in the incidence of neoplasms of the bronchus and the trachea. Cardinal symptoms of primary neoplasms of the trachea are coughing, dyspnea and hemoptysis. One

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42. Walker, J. S.: Neurinoma of the Larynx: Report of a Case, Ann. Otol., Rhin. & Laryng. **56**:898-903 (Dec.) 1947.

43. Lewy, A.: An Unusual Laryngeal Tumor in an Aged Man, Ann. Otol., Rhin. & Laryng. **56**:494-495 (June) 1947.

44. Rosedale, R. S.: Laryngeal Chondroma, Arch. Otolaryng. **45**:543-549 (May) 1947.

45. Schlemenson, M., and Caceres Graziani, E.: Lymphosarcoma of the Larynx: Report of a Case, Arch. Path. **43**:393-395 (April) 1947.

46. Orton, H. B.: Carcinoma of the Larynx: Clinical Report of Case—Age 13½ Years, Laryngoscope **57**:299-303 (April) 1947.

47. Mills, W. H.; Dominguez, R., and McCall, J. W.: Simultaneous Carcinoma and Malignant Lymphoma of the Larynx: Case Report and Review of Literature, Laryngoscope **57**:491-500 (July) 1947.

48. Jackson, C. L.: Laryngocele, Laryngoscope **57**:788-795 (Dec.) 1947.

49. McLaurin, J. W.: Laryngocele—Report of a Case, Laryngoscope **57**: 616-622 (Sept.) 1947.

50. Fisher, G. E.: Primary Neoplasms of the Trachea, South. Surgeon **13**:78-84 (Feb.) 1947.

of the first symptoms may be a tickling sensation which occurs only when the patient lies down. He believes that any patient with cough, dyspnea and blood-streaked sputum should undergo bronchoscopy immediately. A case of cylindroma of the trachea is reported in this paper.

Ellman and Whittaker [51] review 187 cases of primary carcinoma of the trachea reported in 1945. The clinical and pathologic findings in a case of carcinoma of the trachea are described. The diagnosis and clinical features, the pathology and histogenesis and the relation of symptoms to lesions in cancer of the trachea are discussed. Dryness and tickling of the throat with an irritating cough form the first complaints. Dyspnea is the important symptom and stridor the notable physical sign. Examination of sputum for cancer cells does not appear to have aided in the diagnosis of tracheal carcinoma in the cases so far reviewed. In cases of necrotic growths, however, malignant cells might well be demonstrated by this method. Endoscopy and biopsy will establish diagnosis in all cases.

Penta [52] reports the five year cure of a patient who was treated with endoscopic cautery and postoperative roentgen irradiation for a pedunculated squamous cell epithelioma, grade 2, located in the lower third of the trachea.

Smith [53] reports the five year cure of a patient who had an adenoma of the trachea which was removed by excision through the anterior wall of the trachea.

Thorén,[54] in an excellent paper, covers the entire subject of intratracheal goiter. Usually the term "intratracheal goiter" is used to indicate normal or diseased thyroid tissue situated within the trachea or larynx. Intratracheal goiter constitutes 7.4 per cent of all intratracheal tumors. The first case was published in 1875, and since then 79 cases have been reported in the literature available to Thorén. Symptoms usually appear between the ages of 15 and 40 years. In approximately two thirds of the cases an extratracheal goiter could be observed simultaneously. The proportion of incidence of those on the left side to those on the right side is about 4:1. Laryngoscopic exami-

51. Ellman, P., and Whittaker, H.: Primary Carcinoma of the Trachea. Thorax **2**:153-162 (Sept.) 1947.

52. Penta, A. Q.: Primary Carcinoma of the Trachea Removed by Bronchoscopic Procedure, Ann. Otol., Rhin. & Laryng. **56**:790-792 (Sept.) 1947.

53. Smith, M. T.: Adenoma of the Trachea, Arch. Otolaryng. **46**:405-407 (Sept.) 1947.

54. Thorén, L.: Intratracheal Goitre, Acta chir. Scandinav. **95**:495-512, 1947.

nation reveals a round, even curvature inward in the subglottic space. Endoscopic removal may be complicated by bleeding. Thorén advises pertracheal operation and enucleation.

Schall, Jones and associates [55] present a case of congenital tracheobronchial cyst of the esophageal wall which was excised. There is a good discussion on the differential diagnosis in such a case.

TUMORS OF THE ESOPHAGUS

In a discussion of primary tumors of the esophagus, Adams [56] states that, generally speaking, a benign tumor may be suspected if the presenting symptom is difficulty in swallowing of prolonged duration. The lesion may be primary in the esophagus itself, or a tumor in some closely related organ may cause obstruction by extension and secondary involvement of the esophagus. In general, if the mucosa is intact, biopsy should not be performed in benign intramural lesions. Secondary infection which might complicate removal of the lesion later may thus be averted. Benign lesions are diagnosed primarily by roentgenologic examination. In carcinoma it is essential that diagnosis be made early. This can be done only by carrying out roentgenoscopic and barium studies in a large number of neurasthenic patients who complain of dysphagia. Results are improving steadily with early diagnosis and improved surgical technic and management.

Taquino and Joseph [57] studied 145 cases of carcinoma of the esophagus. They found the gloomy picture of advanced processes; widespread metastasis, extension and nonresectability, and a mortality rate of almost 100 per cent, characteristic of most reported series. In this disease radical operation is, for all practical purposes, contraindicated in cases in which metastasis and extensions have occurred; this eliminated 60.7 per cent of the series from all hope of cure by operation. Operative procedures and radiation therapy are applicable only to the small and highly favorable group of patients in whom the disease is recognized early. The responsibility of the esophagoscopist is correspondingly heavy.

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55. Schall, L.; Jones, C. M.; Mallory, T. B.; Wyman, S.; Schier, W. W., and Sweet, R. H.: Congenital Tracheobronchial Cyst of Esophageal Wall, New England J. Med. **236**:672-674 (May 1) 1947.

56. Adams, H. D.: Primary Tumors of Esophagus, S. Clin. North America **27**:587-591 (June) 1947.

57. Taquino, G. J., and Joseph, G. F.: Carcinoma of the Esophagus: An Analysis of One Hundred and Forty-Five Cases with Special Reference to Metastases and Extensions, Ann. Otol., Rhin. & Laryng. **56**:1041-1058 (Dec.) 1947.

W. E. Adams,[58] in his paper on carcinoma of the esophagus and cardia, presented a good over-all picture of the disease. He includes diagnosis, operative technic and results as well as a discussion on the correlation of the pathologic picture with the clinical course.

Puppel [59] states that four outstanding factors lead to radical surgical intervention too late in treatment of carcinoma of the lower esophagus. He said that too many surgeons are probably still doing so-called palliative gastrotomy without consideration of the modern radical operation. "Silent" carcinoma of the esophagus is a second factor. Lack of education of the public concerning the early signs of cancer of the esophagus is a definite factor. Too little use of esophagoscopy and exploratory thoracotomy constitutes a fourth factor which leads to late diagnosis.

Woodward [60] believes that wide surgical excision of postcricoid and cervical esophageal carcinomas, together with adjacent structures when necessary, followed by roentgen therapy offers the only hope of cure at this time. Although malignant tumors of these areas have been reported as cured by radiation, Woodward recommends operation because of his unsatisfactory experience with radiation alone.

Buschke and Cantril [61] state that radiation therapy in the million volt range should accomplish a certain number of cures in esophageal carcinoma if the problem of sterilization is one of adequate tumor dosage. They believe that a number of epidermoid esophageal carcinomas can be cured if the diagnosis is made early and radical treatment is instituted before obstruction is complete or the disease has spread to the regional lymph nodes.

There are many articles which deal with the surgical treatment of carcinoma of the esophagus. Among these are Sweet's,[62] which covers the selection of patients, technic, complication, preoperative and postoperative care and end results, and Jones and associates,[63] in which

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58. Adams, W. E.: Carcinoma of the Esophagus and Cardia, Nebraska M. J. **32**:381-386 (Oct.) 1947.

59. Puppel, I. D.: Early Diagnosis in Radical Resection of Carcinoma of the Lower Esophagus, Am. J. Surg. **73**:695-699 (June) 1947.

60. Woodward, F. D.: The Surgical Treatment of Postcricoid and Cervical Esophageal Carcinoma, Ann. Otol., Rhin. & Laryng. **56**:1035-1040 (Dec.) 1947.

61. Buschke, F., and Cantril, S. T.: Supervoltage Roentgen Therapy of Carcinoma of the Esophagus, J. A. M. A. **134**:127-129 (May 10) 1947.

62. Sweet, R. H.: Carcinoma of the Esophagus and the Cardiac End of the Stomach: Immediate and Late Results of Treatment by Resection and Primary Esophagogastric Anastomosis, J. A. M. A. **135**:485-490 (Oct. 25) 1947.

63. Jones, C. M.; Sweet, R. H.; Wyman, S. M., and Mallory, T. B.: Leiomyoma of Esophagus, New England J. Med. **236**:955-957 (June 19) 1947.

there is a good discussion of the differential diagnosis. Doyle,[64] Garlock,[65] Taylor [66] and Thorek [67] have also covered the technic very well.

Schafer and Kittle [68] report the first successful resection of a large intramural leiomyoma of the esophagus to be recorded in the literature. In this report benign tumors of the esophagus are described with special reference to their surgical treatment. A wide variety of these benign tumors occurs in the esophagus: adenoma, papilloma, polyp, fibroma, myxofibroma, neurofibroma, hemangioma, lipoma, osteochondroma and the most frequent form, myoma.

Ferguson and Hackworth [69] report the first case in which hemangioma of the esophagus in an infant was treated successfully with roentgen therapy. The diagnosis was made when the infant was 7 months of age, and removal of a specimen for biopsy was performed by esophagoscopy. The case is presented to call attention to the fact that hemangioma of the esophagus may account for hematemesis and melena even in an infant.

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64. Doyle, L.: Carcinoma of Œsophagus and Cardiac End of Stomach, Australian & New Zealand J. Surg. **17**:16-28 (July) 1947.

65. Garlock, J. H.: Technical Problems in the Surgical Treatment of Carcinoma of the Esophagus and Upper Stomach, J. Thoracic Surg. **16**:215-224 (June) 1947; Carcinoma of the Œsophagus and Upper Stomach, Lancet **2**:631 (Oct. 25) 1947.

66. Taylor, H.: Œsophageal Carcinoma Treated by Resection and Presternal Œsophago-Gastrostomy, Proc. Roy. Soc. Med. **40**:465-466 (June) 1947.

67. Thorek, P.: Surgical Treatment for Carcinoma of the Esophagus, Illinois M. J. **92**:329-337 (Dec.) 1947.

68. Schafer, P. W., and Kittle, C. F.: Esophageal Leiomyoma: Report of a Successful Resection, J. A. M. A. **133**:1202-1205 (April 19) 1947.

69. Ferguson, C. F., and Hackworth, L. E.: Hemangioma of the Esophagus in Infancy, Arch. Otolaryng. **45**:585-592 (May) 1947.

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